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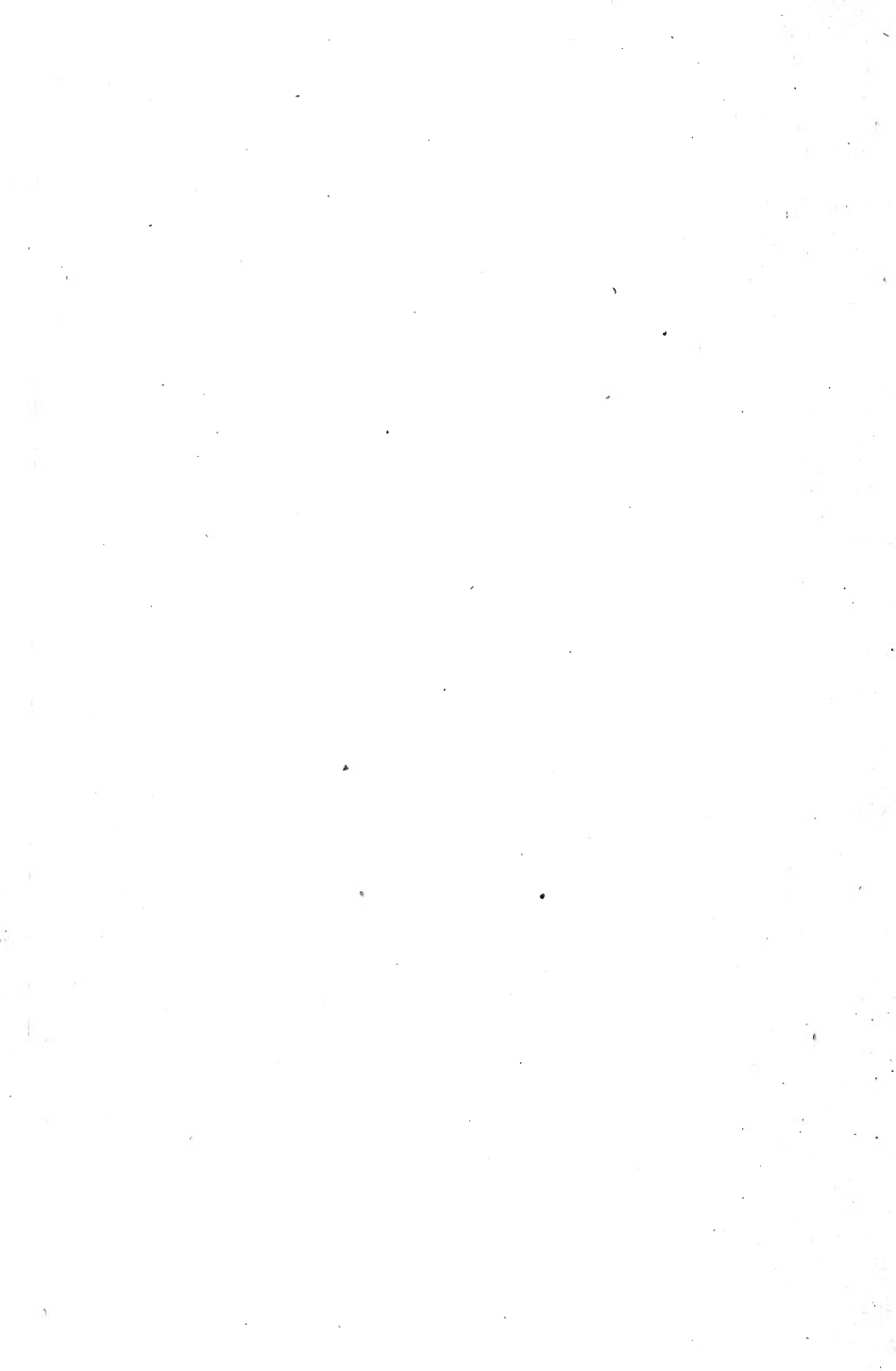
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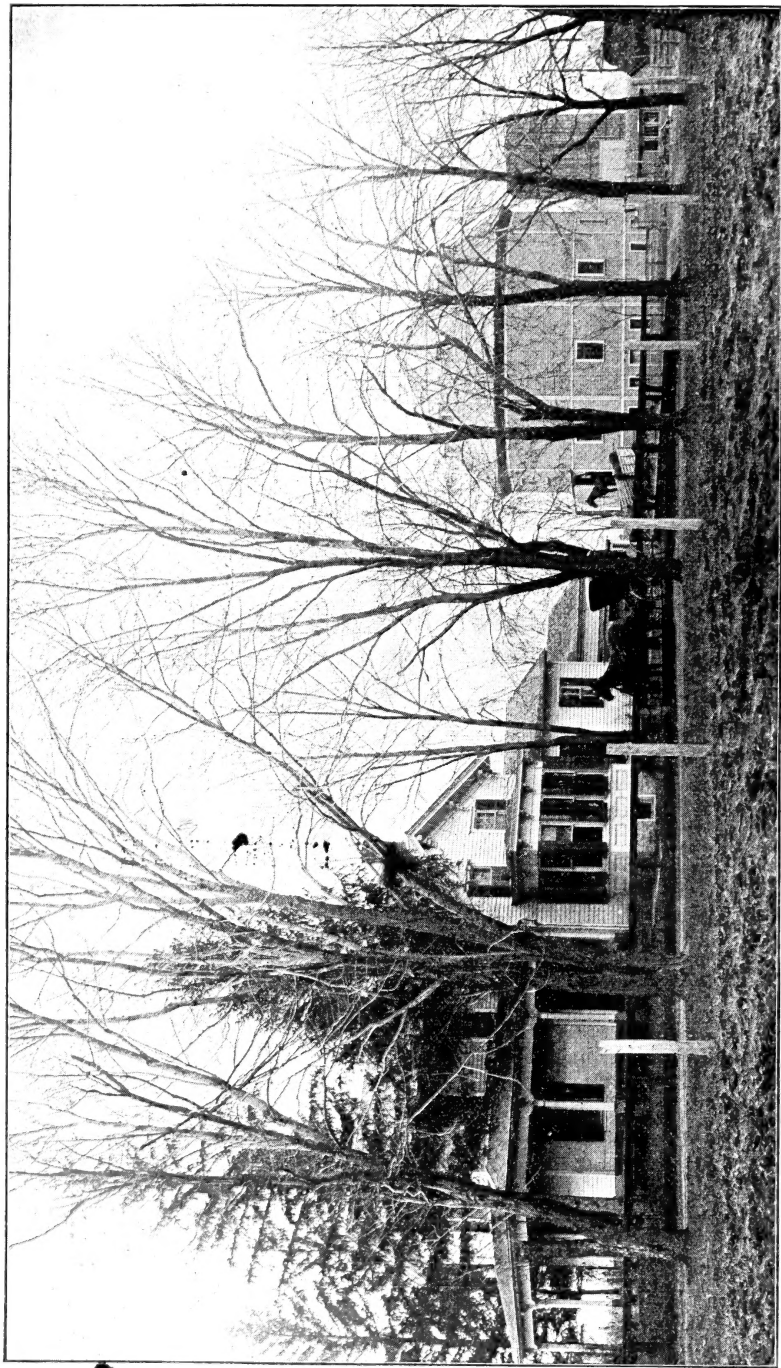
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An Illinois Dairy Farm—These Buildings show what the Dairy Business will Support, as nothing but Butter is sold from this Farm

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# 29th ANNUAL REPORT

OF THE

# ILLINOIS DAIRYMEN'S ASSOCIATION



CONVENTION HELD AT URBANA, ILLINOIS,  
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COMPILED BY GEO. CAVEN, SECRETARY

STENOGRAPHIC REPORT BY MISS E. EMMA NEWMAN

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## LETTER OF TRANSMITTAL

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Office of Secretary

Illinois Dairymen's Association.

Chicago, Ill., 1903.

To His Excellency Richard Yates, Governor of the State of Illinois:

I have the honor to submit the official report of the Illinois Dairymen's Association, containing the addresses, papers, and discussions at its twenty-ninth annual meeting, held at Urbana, Illinois, in the College of Agriculture, Jan. 6, 7, and 8, 1903.

Respectfully,

GEO. CAVEN, Secretary.

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## ***LIST OF OFFICERS, 1903***

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### **President—**

JOSEPH NEWMAN, Elgin.

### **Vice President—**

IRVIN NÓWLAN, Toulon.

### **Directors—**

GEO. H. GURLER, DeKalb.

JOSEPH NEWMAN, Elgin.

L. A. SPIES, St. Jacob.

JOHN STEWART, Elburn.

IRVIN NOWLAN, Toulon.

JOHN COOLIDGE, Galesburg.

J. R. BIDDULPH, Providence.

### **Treasurer—**

H. H. HOPKINS, Hinckley.

### **Secretary—**

GEO. CAVEN, Chicago

**B Y = L A W S**  
**OF THE**  
***Illinois Dairymen's Association***

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**Officers.**

Section 1.—The officers of this Association shall consist of a President Vice President, Secretary, Treasurer, and Board of Directors, composed of seven members, of whom the President and Vice President of the Association shall be members and the President ex-officio Chairman.

**Duties of the President.**

Sec. 2.—The President shall preside at the meetings of the Association and of the Board of Directors. It shall be his duty, together with the Secretary of the Board of Directors, to arrange a program and order of business for each regular annual meeting of the Association and of the Board of Directors, and upon the written request of five members of the Association it shall be his duty to call special meetings. It shall be his further duty to call on the State Auditor of Public Accounts for his warrant on the State Treasurer, for the annual sum appropriated by the Legislature for the use of this Association, present the warrant to the Treasurer for payment and on receiving the money receipt for the same, which he shall pay over to the Treasurer of the Association, taking his receipt therefor.

**Duties of the Vice President.**

Sec. 3.—In the absence of the President his duties shall devolve upon the Vice President.

**Duties of the Secretary.**

Sec. 4.—The Secretary shall record the proceedings of the Association and of the Board of Directors. He shall keep a list of the members, collect all the moneys due the Association (other than the legislative appropriations), and shall record the amount with the name and postoffice address of the person so paying, in a book to be kept for that purpose. He shall pay over all such moneys to the Treasurer, taking his receipt therefore. It shall also be his duty to assist in making the program for the annual meeting and at the close of the said meeting compile and prepare for publication all papers, essays, discussions, and other matter worthy of publication, at the earliest day possible, and shall perform such other duties pertaining to his office as shall be necessary.

**Duties of the Treasurer.**

Sec. 5.—The Treasurer shall, before entering on the duties of his office, give a good and sufficient bond to the Directors of the Association, with one or more sureties, to be approved by the Board of Directors, which bond shall be conditioned for a faithful performance of the duties of his office. He shall account to the Association for all moneys received by him by virtue of said office and pay over the same as he shall be directed by the Board of Directors. No moneys shall be paid out by the Treasurer except upon an order from the Board, signed by the President and countersigned by the Secretary. The books of account of the Treasurer shall at all times be open to the inspection of the members of the Board of Directors, and he shall, at the expiration of his term of office make a report to the Association of the conditions of its finances, and deliver to his successor the books of account together with all moneys and other property of the Association in his possession or custody.

**Duties of the Board of Directors.**

Sec. 6.—The Board of Directors shall have the general management and control of the property and affairs of the Association, subject to the By-Laws.



Four members of the Board shall constitute a quorum to do business.

The Board of Directors may adopt such rules and regulations as they shall deem advisable for their government, and may appoint such committees as they shall consider desirable.

They shall also make a biennial report to the Governor of the State of the expenditures of the money appropriated to the Association by the Legislature.

It shall be their further duty to decide the location, fix the date, and procure the place for holding the annual meeting of the Association, and arrange the program and order of business for the same.

#### **Election of Officers.**

Sec. 7.—The President, Vice President, and Board of Directors shall be elected annually by ballot at the first annual meeting of the Association.

The Treasurer and Secretary shall be elected by the Board of Directors.

The officers of the Association shall retain their offices until their successors are chosen and qualify.

A plurality vote shall elect.

Vacancies occurring shall be filled by the Board of Directors until the following annual election.

#### **Membership.**

Sec. 8.—Any person may become a member of this Association by paying the Treasurer such membership fee as shall from time to time be prescribed by the Board of Directors.

#### **Quorum.**

Sec. 9.—Seven members of the Association shall constitute a quorum for the transaction of business, but a less number may adjourn.

**Annual Assessment.**

Sec. 10.—One month prior to the annual meeting in each year the Board of Directors shall fix the amount, if any which may be necessary to be paid by each member of the Association as an annual due.

Notice of such action must be sent to each member within ten days thereafter, and no member in default in payment thereof shall be entitled to the privileges of the Association.

**Amendment of By-Laws.**

Sec. 11.—These By-Laws may be amended at any annual meeting by a vote of not less than two-thirds of the members present. Notice of the proposed amendment must be given in writing, and at a public meeting of the Association, at least one day before any action can be taken thereon.

# PROCEEDINGS

OF THE

## *Twenty-Ninth Annual Meeting*

OF THE

# Illinois Dairymen's Association

*Held at Urbana, Illinois, January 6th, 7th and 8th, 1903*

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The Illinois Dairymen's Association met in annual session in Agricultural Hall, University of Illinois, at Urbana, January 6, 1903, at 1:30 o'clock p. m.

President Joseph Newman in the chair.

By the President:—

It is my duty to call together again this Illinois Dairymen's Association for its 29th annual session. We will open the proceedings as usual, with prayer, by Rev. Franklin L. McGraff, pastor of the Congregational church of Champaign.

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PRAYER.

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Rev. Franklin McGraff:

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Let us all bow our heads.

Our Father Who art in heaven. Thou Who art the Infinite and Immortal Spirit; Thou hast given to us life and truth. We bow in Thy pres-

ence at this afternoon session, asking that Thy gracious benediction and Thy guidance will be with us throughout this conference.

We thank Thee, O God, our Father, that as we discover the secrets of nature, as we study Thy way in the world, that we enter by that same token into Thine own Divine mind.

We thank Thee that Thou hast made us thus to co-operate with Thee; that whatever be the name of our craft, that we may be co-laborers with our Divine Father, who worketh with us.

We thank Thee that we are not only working together for our fellow men in our daily service, and bringing joy and contentment and well being to earthly life, but that in a higher sense and better sense we are working toward the Infinite and toward Him whom we serve.

Therefore we ask Thy blessing on these classes who have met here to-day. We thank Thee for their determination, for the places they occupy in this State, and for the worthy men who have here served. We pray especially that in the temptations and the discouragements that come to these brethren, they may recognize that there is a source of strength that comes from on high. Not in our own strength should we carry on this task, but recognize that all the force of nature are the forces of God and through them come in contact with God, and thus have our labor dignified by this truth.

Bless this session and others that are to follow and all who take part; we ask it in the Saviour's name. Amen.

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#### ADDRESS OF WELCOME.

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By the President:

We have a note from Mayor A. J. Glover, of Urbana, saying he regrets his inability to meet and greet the Association this afternoon. He has an engagement which makes it impossible for him to be present and

has been unable to secure a substitute. I will read what he has written to us:

"Mr. Geo. Caven, Secretary.

My Dear Sir: I regret exceedingly my inability to meet with and greet the Association this afternoon. Engagements which I am unable to control make it impossible for me to be present and I have been unable to secure a substitute.

Will you kindly present my regrets to the Association, as contained in paper herewith, or verbally if you prefer.

Respectfully,

Jno. A. Glover, Mayor."

"Urbana, Ill., Jan. 6, 1903.

Mr. President and Gentlemen of the Illinois Dairymen's Association:

It would have given me very great pleasure to have been with you today, and to have taken by the hand so many men prominent in this great work of sanitization and betterment of milk and milk products, but engagements previously made compel my presence elsewhere.

From the cradle to old age the human race is absolutely dependent on this product, and upon its purity rests the lives of the hosts innumerable of the young and rising generations. When is considered the delicate absorptive quality of milk and the ordinary manner of its production, assimilating poisons of deadly character from every surrounding, the wonder is, not that there is so much sickness, but that there are not universal ills attributable to the poisons allowed to accumulate in this food.

The difficulties you have to encounter in your work are great, but your recompense will be in the improved health in the communities accepting your better methods. As one having an early and primitive experience in the dairy business, it seems to me I should be allowed to be a member of this Association, for as a boy it was my duty to handle and care for the 'horned and burr tailed cow,' and it has always been an open question in my mind, whether it were better to 'suffer' the flings and flirts of an en-

raged cow's tail,' while endeavoring to cause the milk to flow or in despair to sit on the tail and suffer the consequences.

Urbana with its population of 7,000 people, the capital of one of the richest agricultural counties of the world, greets you. Her well-paved and beautifully (in summer) shaded streets are yours.

Here is located the great University with its 3,000 students, the Big Four Division Shops, employing between 400 and 500 men besides 150 railroad men in other service.

With all its advantages, educational, agricultural and mechanical, it is eminently a home city and offers an open field for manufactories and other extensive business interests.

Gentlemen of the State Dairymen's Association, as Mayor of the City of Urbana, I have the honor of welcoming you most cordially to our City."

Mayor Muliken, of Champaign, is also unable to be present but has sent us his representative Mr. F. B. Hanill, City Attorney.

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### ADDRESS.

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Members of the Illinois Dairymen's Association. In the absence of the Hon. C. J. Muliken, Mayor, I have been delegated to extend to you a cordial and hearty welcome to the grand old City of Champaign.

I assure you that we want you to feel at home in our midst. I had been instructed to completely and deliberately turn the town over to you. We do not want you to feel as if you are strangers in a strange town and among strange people. I have been instructed to say we want you to feel as if the town was yours.

We are proud of the City of Champaign, and we are proud of our citizens. We believe that we are about one of the best cities on earth, and about the best people, and we are proud of the intelligence and morality of the community in which we live. But I must confess that in spite of all these advantages that we must acknowledge that this ASSO-

ciation presents as fine a looking body of men as you will find anywhere. It seems to me as if a committee had been appointed throughout the State and brought together the best looking men and ladies that could be found.

Now we are a very peculiar people, very particular as to whom we extend the hand. We appreciate this organization not because we realize that it is not only a benefit to the people throughout the State; for the products it puts on the market, which are the very best that can be had.

We trust that your meeting here among us will be pleasant and profitable to you as no doubt it will be to us.

Now Mr. Chairman, I wish to present to you this little key and with it the freedom of our city. You have the freedom to our homes and our hearts and to our city, and may this Association always consider that they are welcome to this grand old City of Champaign, that it is always open to the members of the Illinois Dairymen's Association.

By the President: I thank you. I will place the key here where you can all have it, and go where we want to, and you may know that you are perfectly safe in giving this key to us

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#### RESPONSE.

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Mr. C. H. Gurler, of DeKalb.

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Mr Chairman, Ladies and Gentlemen:

In behalf of the Members of the Illinois Dairymen's Association I thank the representative of the Mayor of Champaign and the Mayor of Urbana for the kind words so eloquently spoken.

It is a pleasure for this Association to know that they are welcome to this University building and to the Cities of Champaign and Urbana. When I first learned that the Association had accepted the invitation to hold this 29th annual meeting in this building I was pleased. It was an assur-

ance to me that the meeting would be a successful one, and if it is not a successful one, it will be no fault of the officers of this University or the citizens of Urbana and Champaign.

We are holding this meeting in the finest agricultural building in America. The officers, professors and instructors are the best that money will hire. The machinery and equipments correspond with the building and the surroundings here are not excelled in any country.

Our Secretary has prepared a fine program. We must receive an unlimited amount of good from coming in contact with the professors and instructors of this university, the gentlemen who are on the program and the surroundings.

It is gratifying to know that that the best of relations exist between this university and the various organizations in the State adapted and devoted to agriculture. This university receives some of our brightest pupils of the public schools to enlarge their minds on the various branches of study, and from year to year go out from this university the most cultured young men and women to brighten our homes throughout the glorious State of Illinois.

We accept your hospitality and the freedom of your cities and this university in the spirit in which it was given.

We also accept the key to your cities, given us by your representative who so ably delivered the address of welcome to this Association.

I trust your confidence in us by the delivery of this key to this Association will not be misplaced.

I thank you for your hospitality and the freedom you have offered us and also for your kind and hearty welcome.

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#### PRESIDENT'S ADDRESS.

Mr. Chairman, Ladies and Gentlemen, Members of the Illinois Dairymen's Association: The healthy condition in which we find the dairy busi-



ness, coupled with the fact of meeting with you here in this beautiful hall, surrounded by earnest workers in all lines of agriculture, makes one feel proud that he is a dairyman, and that his lot has been cast in this grand commonwealth of Illinois.

Since our last annual meeting at Freeport, the oleo fight has been won and every one who keeps a cow has been benefitted. I must remind you that too much praise cannot be given to the National Dairy Union, and most especially to its untiring Secretary, Mr. Chas. Y. Knight, who can never be suitably repaid for the grand work he did for our cause in that fight, and I most heartily recommend that our Committee on Resolutions recognize that fact in an official way. While we are enjoying the fruits of that fight, we must in some way provide for a "Watchman in our tower" continuously, and we must give our help to the National Dairy Union in any way that we can. The best way is to do what they ask of us. This year they ask every dairyman to buy the Patrons Hand Book for \$1.00 per copy, which of itself is worth many times that on any farm in the hands of an intelligent person; and for creameries to pay one cent for each 60 lb. tub of butter or its equivalent they turn out. Some may think because the law is passed we can relax our efforts, when the facts are, the work has only commenced, and to make the law effective we must aid the government in many ways, and with Mr. Knight driving the "Patrol Wagon," he will take the officials right where they are needed to keep the butterine manufacturers in line.

I would recommend all makers of butter, whether dairy or creamery, to see their butter is kept a uniform June color the year around by a judicious use of a good butter color, then it will be a simple matter for any purchaser of butter anywhere to know that he gets what he asks for. Also that every dairy or creamery in the State be more particular as to cleanliness. Make yourself a New Year's present of a resolution that your dairy or creamery shall be invitingly clean every day of the year 1903. This will be one of the best ways to aid the National Dairy Union in fighting your cause.

At our Director's meeting last February, your officers decided that the most efficient work that could be done would be along educational lines, assisting the Dairy Department of our Agricultural College, when and where we could. I have given some time in traveling over the State, and quite a little thought as to how best to reach the home dairies, and give them the information they seem to so sadly need, and have thoroughly convinced myself that what is most needed, is a few good practical instructors in the field to supplement the work of our Dairy School here.

The State could use five good field men, and their cost would be small compared with the results. They should visit every farm in the State where a cow is milked, and practical information should be left there of how to grow the feed, when and how to feed it and the kind of cow to feed it to, how to care for milk and how to make good, clean, sweet butter. You can readily see how such a force in the field would be agents of the College proper, and strengthen it in all its branches, fill its dairy room with a bright class of students, and add millions to the wealth of the State, for it is a fact that the simplest dairy knowledge is lacking where a large portion of the dairy butter is made. For proof, go to any grocery store in any town of the State, and sample the different makes of butter brought in, and while the grocer, for reasons of his own, may pay the same price for it, the loss is there for someone to bear and I believe if we bring this request in proper shape before the authorities, they will put the dairy department of our College in position to carry out this suggestion.

The Farmers Institutes whenever held should be asked to have a practical dairyman to give his knowledge in a simple way. I say simple, because we are so liable to use terms that are not readily understood, and the most effective talk is one that can be understood by everybody present. By going into every County and Town of the State once a year, a great help can be had from this source.

The country school can be made a most efficient medium for communicating agricultural information to the farmer, and his help through the children and young people. If the rural teachers are alive to the situation, they will inform themselves on dairy knowledge and so be ready to impart

it to their pupils. The young folks are hungry for this information, and you can interest them in it just as well as you can interest them in corn raising. The two should go together.

I believe the Agricultural papers could use the head of their dairy columns to no better advantage than by placing there a few of the more simple rules on butter making. As a reader of Hoard's Dairyman, it is interesting to note how often the same question is asked, and is one of the reasons why I came to the above conclusion. I don't see how anyone can keep up-to-date in dairying, unless he takes at least one good dairy paper.

At our last annual meeting, resolutions were passed asking the several breeders of dairy cattle in the State to organize and send their representatives to meet with us. I know some work has been done in that line, and I feel hopeful that much good will come to all concerned, if this is worked up. I can report progress and recommend to continue the work until the best animal of any dairy breed can be purchased in Illinois. Is not a dairy animal "Live Stock"? If so why don't our breeders work with the Live Stock Breeders Association? And as Chicago is the best market for anything that has value in live stock, I am sure the dairy breeds would receive just recognition and regular sale days. I thank the gentlemen who have interested themselves in this work and anything this Association can do to help them, I am sure will be done to the best of our ability.

During the past year, I have had communication with the President of the State Board of Agriculture and some of its members, and showed them that the dairymen of Illinois were not given proper quarters on the State Fair grounds, either to display their products, or, what is more necessary, to show the thousands who visit the "Best Fair on Earth" how to manufacture butter. I have recommended to them that they erect a dairy building of such capacity that both butter and cheese can be made before the public view, and a suitable refrigerator to exhibit both dairy and creamery butter and cheese. I am pleased to report the suggestions were received with favor and they had already a committee who have reported favorably after

visiting the Wisconsin State Fair. President Conrad invited me to submit plans for such a building as in our judgment was needed. I sent in two rough sketches of floor plans made hurriedly by Prof. Erf, and on receipt of them the President assured me he would recommend it in his annual address to the new Board, which meets this month.

Now the best way to get a thing is to work for it. Hence I urge every dairyman to write his member of the Legislature whenever he sees anything asked by the State Board, or by the Agricultural College for the dairy department, to be sure and vote for it. I believe we should cultivate the acquaintance of the State Board, the Farmer's Institute, and in fact, all bodies that are in sympathy with agriculture.

Your directors, as you are undoubtedly aware, were unanimous in selecting Mr. George Caven, of Chicago, as our Secretary. His ability, together with his pleasant manner makes friends for our Association, and he has become a fixed part of the organization. We know he can ill afford to take the time from his business to attend to the duties of his office, but his love for the dairymen is such he could not say No.

The accounts of the Treasurer were gone over by the Auditing Committee and found correct. Mr. Hopkins, of Hinckley, was elected Treasurer, and our finances are in excellent hands.

In the work you lay out for this year, you must not forget that it is this spring our appropriation must be asked for from the legislature, and you will all write, or better yet, see your legislator and impress upon his mind the necessity of taking an interest in dairy matters, and, most of all to see that our regular appropriation, the same as before, is on the appropriation bill and that he votes for it. We ask no increase, preferring all other dairy appropriations be made to the Dairy Department of the Agricultural College direct and working shoulder to shoulder with them.

I wish to thank Dean Davenport and his assistants for the interest they have taken in all matters pertaining to dairying; also the Advisory Committee, and while the appropriation was small, feel that it has been wisely spent, and that the present legislature will be more liberal with our department at the college, so that the field work may be much enlarged.

I am pleased to note that a short course in dairying in connection with the corn judging, is to be held January 19th for two weeks. It is a starter and Prof. Erf must not get discouraged if the attendance does not come up to his wishes. If it does not, I would advise him to visit the creamery boys in Northern Illinois and get acquainted with them in their factories, benefiting them all he can with his knowledge while with them. I believe field work for creameries is needed just as it is for dairies. For while Illinois is considered ahead in the production of dairy products, according to the census of 1900, her 1,000,000 cows only brought in \$30,000,000 or about \$30.00 per cow average, and nearly all experiment stations agree that it costs that much to feed the average cow; hence, where's the profit? The returns from our million cows should show at least \$50,000,000. To whom must we look to show our dairymen how to get this other \$20,000,000? As I see it and understand it, it must come through education, and we are here at the fountain head of agricultural education for Illinois. Will the State back its dairy department by an appropriation of \$25,000.00 per year, for five years? If so the farmer can be taught how to weed out his unprofitable cows; how to grow and feed a balanced ration; how to build and fill his silo, which from my own experience, no dairy farm, no, I will leave out the word "dairy" here, and say, no farm that feeds stock of any kind can afford to be without. 25 acres of corn put into 2 silos, say 18x30 feet each, will feed 50 head of animals of 1000 pounds size from October to May. Will the State invest \$125,000 for the increased returns of \$20,000,000 per year from our cows? It is not for the creamery interests I ask this, it is for the farmer and in a large majority of cases it is for the private dairyman. The 1900 census tells us 52,000,000 pounds of butter and 324,000 pounds of cheese are made on farms in Illinois. If this could be of grade sold on the Elgin Board of Trade each week, it would increase its value to the farmer 25 per cent. It tells us the Illinois cow only gives less than 4,000 pounds of milk per year. By weeding out poor cows this can easily be increased 25 per cent, and these are facts and I believe the work commenced by this college through Mr. A. J. Glover is of immense value and must be continued, and while the results may seem small to

the department here, it will be sure to permeate the whole of each district wherever the work is done, just as sure as the harvest follows the seed time.

I want to thank you all in connection with the dairy department of our college for the hearty co-operation you have given this association. Don't get discouraged but keep everlastingly at the work and the results will soon be seen by you, in larger classes, greater interest, and your graduates called to places of prominence all over the world.

I had hoped to have a milking machine here in operation, the Lawrence-Kennedy machine, made in Glasgow, Scotland, and reported to be in successful operation in some large dairies in Australia. In answer to my inquiries I received two letters.

I feel very much encouraged on this question, and hope ere our next annual meeting to know that the much-needed milking machine is an accomplished fact.

I must remind our creamery butter-makers that Mr. Sudendorf, the genial Secretary of the National Creamery Buttermakers Association has arranged with the U. S. Department of Agriculture to hold another Educational Contest commencing January, 1903, and ending at the annual convention in October. It will aid every buttermaker who undertakes it, and I hope to hear that Illinois has a larger number in this contest than were there last year.

In closing, I will call your attention to our program. It is somewhat different from our usual order. Being held here at the college, it gives us facilities for stock judging and practical dairy work that we hope will be appreciated. The gentlemen and ladies who will talk to us are among the best this country affords, which means the best in the world, and I bespeak for them an enthusiastic reception. Thursday morning we have reserved for stock judging and for Machinery Hall, where will be shown you the latest improved dairy machinery in operation. And here I wish personally to thank the supply dealers and transportation companies for the generous helping hand, ever ready to meet the call of this Association

on their time and purse, and we hope the benefits received may well repay them.

I wish to call special attention to the ladies on our program. This afternoon the President of the Sangamon County Woman's Dairy Association will be with us and tell us of "Farm Butter-making and County Organization." The Sangamon County ladies are doing a great educational work and I hope it may be imitated by the ladies in every County of the State, because when the women in any community work together for any purpose, they accomplish it, hence what can the ladies do for dairying in Illinois and the raising of the standard of Illinois dairy products? God speed the work of the ladies. With their help we can fill this building with dairy students, who shall go out into the world to bless humanity.

By the President.—Before I appoint committees, I will wait a little longer to see who to call upon to put on these committees.

The only one I will appoint at present, and that is the most essential, the Committee on Membership. There are certain expenses of this organization. One is a membership fee of one dollar, and I hope you all will become members.

I will appoint Mr. E. Sudendorf, Chairman, Clinton; Irvin Nowlan, Toulon; A. J. Glover, Elgin.

The badges are here and I hope you will get to work and do the best you can in securing memberships for the association.

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## THE DIFFERENT TAINTS OF MILK.

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By J. A. Latzer.

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• In studying taints of milk, we devote our time to a subject that is of interest to all. The government reports tell us, that the exact extent of the dairy industry is not known, but it is safe to say that it is exceeded by no other. Milk is considered the one food, upon which life can be sus-

tained longer than on any other, and rightly so. It contains all the ingredients necessary to sustain life, and in practically the same proportion as is required by the system. "We live not upon what we eat but upon what we digest," that is, upon the part which is assimilated and made use of by the system. Milk, when in a pure, wholesome and untainted state, is the most easily digested food we have; but when it is in any way tainted, it is rendered unpalatable, its digestibility is impaired, and its value, to the cheese and butter maker, as well as to the manufacturer of condensed milk, is greatly decreased.

In studying these various taints of milk, we will consider them, for convenience, as being of three classes. First: those that are found in the milk, when it is drawn from the cow; second: those produced by absorption after it is drawn, and third: those caused by bacterial growth.

That slight but distinct animal odor, noticeable in all milk immediately after it is drawn, is liked by some people. Generally this odor renders milk unpalatable, especially if it has been allowed to remain in some warm place for any length of time. This taint can quite readily be removed, by proper cooling and aeration. Cooling, in order to be done thoroughly, should be done as soon as possible after milking. The can should be placed in a tank of cold water, and still better, running water, and the milk should be stirred until cold. When there is only one milker, the milk should not be allowed to remain in the barn until a large canfull is milked, but should be taken to the cooling tank as soon as one cow is milked. Probably the best method of cooling is to run the milk over one of the many advertised patent coolers. This gives the milk a good chance to aerate, and the cooling is done quickly and thoroughly.

The liquid secreted directly after parturition is known as colostrum. It is a thick, yellowish, viscous liquid. In composition it differs very much from normal milk. It contains a very large per cent of albumen and ash, but its content of sugar is very low. Although it is not fit for human use, it is exactly what is needed for the young calf. The boiling test and the microscope are the best or quickest means of detecting colostrum.



In the course of a week or ten days the milk gradually becomes normal and can then be used for the purposes to which milk is generally put.

As a cow approaches the end of the period of lactation, she becomes feverish and the flow of the milk abnormal. The milk, when thus tainted, should not be used.

The quality and kind of food, and the manner of feeding the cow, has a decided effect upon the quality, as well as the quantity of the milk she will give. Noxious weeds, which possess a strong odor, such as onions, and garlic, when eaten by the cow, will produce taints in the milk. Turnips and cabbage will have the same bad effects on the milk, when fed to the cow. The volatile oils, which these plants contain, diffuse through the animal system and gain access to the milk. It was formerly thought that ensilage would transmit an odor to the milk, but it is now known that if it is in good condition and rightly fed the milk is not tainted.

In order that we may get the best possible returns, as well as the best kind of milk, the cow's health should receive the most careful attention. The cow is often compared with a machine, but we must remember that she is a great deal more than a dead, inert structure; she has life and she responds nobly to good treatment and good feeding. It is not enough to merely place the feed before her. The feeder's duty is to see that she has enough to eat and yet not too much.

When a cow is overfed, which often happens with a greedy one, or with one that has previously received too small a ration for some reason, her system becomes feverish and the milk will be tainted. The sudden change from dry feed to grass, in particular if the cows are turned on to rye or clover pasture, causes a derangement of the digestive organs and to the milk will be imparted a pronounced, grassy odor. Such changes should be gradual so as to give the digestive organs an opportunity to get adjusted to the change.

A somewhat similar but less pronounced taint, which like the grass taint, is in evidence when the cow is scouring, may be caused by running, from excitement or from free access to cold water when the cow

is heated.. Similar results are produced when the cow is kept in a barn that is too warm or in one with very poor ventilation.

The milk from a diseased cow should not be used under any circumstances. The milk should be discarded until a veterinarian is consulted or until the cow is again in good health.

Injury to the udder is sometimes the cause of bloody milk, but more often the cause of inflammation of the injured part, and the result will be clots in the milk and in serious cases suppuration may set in. An experienced milker should detect this trouble while milking and discard the milk. To be sure, bad effects do not always follow when such milk is used, but it is never known what the consequences might be.

It has been found that milk is a good absorbant, in particular just after being drawn from the cow, that is, while yet warmer than the surrounding atmosphere. For this reason it should not be exposed to the barn air longer than necessary.

The milk house should be well ventilated and kept scrupulously clean. The floor should be of cement and all tanks galvanized iron. All milk utensils should be of tin and well washed with hot water every time they have been in use, and set on ends to dry and then exposed to the sunlight as much as possible.

The sense of smell is the best means of detecting the bad odors or taints just mentioned. With practice and close observation this faculty can be developed to a very high degree.

We have referred to the taints that are in the milk when drawn from the cow, caused by improper feeding or some organic trouble of the cow, and to those caused by absorption from being exposed to bad odors of the barn and its surroundings. The most serious trouble and greatest loss, however, is by the decomposition of the milk itself, caused by the growth of bacteria, which develop very readily under the conditions found in the milk at the time it is drawn from the cow, which supplies all their requirements, viz., food, moisture and heat.

Bacteria, sometimes called germs and microbes, are minute unicellular plants, belonging to the lowest class of the vegetable kingdom. On

account of their minute size their study is surrounded by many difficulties. They multiply very rapidly by fission (splitting in two). Some species change to the spore form when conditions are no longer favorable for them to multiply, and in this state they can remain for a long time and again come back to the vegetable state when conditions and surroundings are favorable for their development.

If we consider how rapidly these germs multiply, we can form an idea of the amount of damage they can do; under favorable conditions the offspring of one single germ may be millions in twenty-four hours.

The importance of preventing bacteria from getting in to the milk and that of making the conditions of their development as unfavorable as possible, must thus be apparent to every dairyman.

Chemicals and heat are the only practical methods known for the destruction of bacteria. When in the vegetable state a temperature somewhat less than the boiling point will destroy them, but when they are in the spore state a considerable higher temperature and applied for a longer time, is required.

The chemicals generally used for this purpose are borax, salysilic acid and formaldehyde, or some preparation from them. It can be taken for granted that if a chemical is of such a nature as to destroy germ life, it is injurious to the human system and should therefore not be used in connection with food products.

Some species attack the sugar in the milk and some the albuminoids, while others exist and live in milk and apparently cause no change.

The majority of bacteria develop very readily in milk and the temperature at which they multiply most readily and thus taint the milk most quickly is at blood heat, and the lower the temperature, that is, the cooler the milk, the slower their development.

Different bacteria taint milk differently, but the same species always affect milk in about the same manner, and it is one of the methods for the identification of different species. For instance, *bacillus acidilactici* always produce lactic acid (souring). Although Prof. H. W. Conn. in the U. S. bulletin 25, office of Experiment Station, in speaking of lac-

tic fermentation, says: "At the present time a large number of species (over one hundred) have been described as producing the acid fermentation in milk. To what extent, however, they are all to be regarded as producing lactic acid, we can hardly say, because in most cases no attempt has been made to determine chemically the presence of lactic acid, the investigator ordinarily being contented with the determination of the production of an acid reaction." Even if it were known that all produced lactic acid, it would be very doubtful if the percent of acid is exactly the same for each species, taking for granted that the conditions under which the reactions took place were exactly the same.

Another acid quite frequently met with is butyric acid, produced by *bacillus butyricus*. These are met with as frequently as the germ producing lactic acid and it was formerly supposed this was a contamination of the latter.

The viscosity of milk is often greatly increased by the action of bacteria; it may become so marked as to produce "slimy" or "ropy" milk, that is, the milk will be so sticky that when touched with the fingers long threads of milk will adhere to them.

Another very disagreeable taint is produced by a certain species of bacteria imparting a bitter taste to the milk.

The soapy flavor caused by a yet different species occurs very seldom.

Milk may be curdled through the action of bacteria without the production of acids. These forms produce rennet, which coagulates the milk.

The production of color is, however, much more common than some of these other taints. The red pigment in milk, produced by *B. prodigiosus*, is often mistaken for bloody milk. This same form is the cause of small red or bloody spots in bread, frequently the cause of much superstition. A blue color in milk, produced by *B. cyanogenes*, is not uncommon and yellow and green are sometimes met with.

The putrefaction of milk is caused by species of bacteria attacking the albuminoids, producing various substances, among them the ptomaines, some of which are very poisonous. This process of decomposition

tion seems to be similar to that in meats, fish, oysters and all substance rich in albuminoids.

There is yet another form of bacteria which occasions great alarm when they make their appearance, and these are in the disease producing germs which may get into the milk from clothes or utensils exposed to the sick room, and in various other ways. The germs of tuberculosis, typhoid fever and many others of the dreaded diseases often find their way to the human system through milk. The presence of these organisms cannot be detected by any apparent change in the milk; it does not appear any different to the eyesight; it does not taste any different, nor can anything out of the ordinary be detected by the sense of smell. Milk tainted by these disease germs will show no reaction to the acid test, even the skilled bacteriologist may not be able to detect their presence with the newest scientific methods, and the aid of the most powerful modern microscope.

If we stop for a moment and think of the extent milk and its products are used as human food, think of the invalids and infants who almost exclusively depend on milk for their substance, and then consider the harm that may result if the milk is not in proper condition, the question so forcibly presents itself that it should receive our best efforts and most earnest consideration.

Let us consider it our duty to adopt good methods of feeding, so that the animal's health may not be impaired; use every precaution in the care of milk; cool it quickly and thoroughly; constantly aiming for the best results, and in doing so we will help to promote the foremost industry of our land.

#### DISCUSSION.

Q.—Mr. Coolidge: What produces the slimy milk you speak of; where does the bacteria organisms form?

A.—The name of the species?

Q.—Where does it start from?

A.—It may be produced from many different sources. It is hard to tell where the species come from. There are so many ways it can come from. Of course, in one case it may come from one source, and in another case it may come from another source. It could not be answered definitely.

Q.—Would like to learn something that would keep from getting it. I know a thorough sterilization will help get rid of it, but where do you get it?

A.—Adopting the most cleanly methods is the best way to prevent them getting into the milk.

Q.—Mr. Glover: I am somewhat interested in the question of effect of fed upon the different flavors of milk. This gentleman speaks in regard to onions and turnips and in regard to silage. Our condensing factories do not allow them to feed it.

A.—I think the reason they do not allow the farmers to feed silage is because so very few men know how to put up silage in proper condition, and they do not know how to feed it.

Q.—Ever have any experience in feeding rape?

A.—Never had any experience with our farmers.

Q.—In connection with condensing factories?

A.—No one has ever tried it, so cannot tell the effect on the milk.

Q.—What has been your experience in feeding heavy ration of corn meal; what flavor do you get and what effect has it on the cow?

A.—If the cow is fed up to the corn ration gradually it does not affect the milk as far as we could learn.

Q.—You can't feed too much corn if increased gradually?

A.—Not with our farmers. It does not hurt if increased gradually.

Q.—Ever had any experience with rye pasture; what flavor?

A.—Rye pasture caused trouble in the spring. It is generally the first pasture they have and the farmers are not particular enough to feed up to this point gradually. If fed dry feed with rye and reduce dry feed gradually and proportionately increase the rye we have little trouble. Only have trouble when they jump into it too quickly.

Q.—What flavor is produced from rye pasture?

A.—Well, it is similar to that produced from other pasture. If scouring takes place the milk will be tainted.

Q.—Do I infer the objectionable flavor is nothing more than you get from any green pasture?

A.—It is more pronounced.

Q.—Have you ever had any experience with cows eating rye that is heading out?

A.—Not that I recall now.

Mr. Nowlan.—We sowed some rape with clover. One day the cows got in the rape and for two days you could not stay around those cows while milking. It was a place where the rape was grown up maybe eight inches high above everything else. Mr. Coolidge has had the same experience.

Mr. Coolidge.—We seldom ever raise any corn after the last plowing and after picking the corn out, turn the cattle on, but they began on the rape very gradually, eating corn first and tasting the rape and it did not seem to have any affect upon the milk at all. We are selling milk, but not making butter. The effect was very slight.

Prof. Erf.—Why the way they tried it here, they took as much of the flavor out of the rape as possible and kept the cows in the stable and found that no flavors were produced in the milk. They tried to determine in that case whether it was absorbed by the milk or from the outside. They can feed the animal rape as it was and they found that if the animal is fed with rape before milking it would produce quite a decided flavor, but after milking it had no effect to any great extent. If you feed rape in large quantities it will produce a rank flavor. There is no question about it. Mr. Latzer is right in his statement that you can gradually feed a larger quantity than if you feed all at once, that is, start all at once. His point is right in that respect.

Mr. Spies.—We operate a line of creameries on the same road that the condenser with which Mr. Latzer is connected, and the farmers down there have sold a considerable quantity of rape in the last year or

so and recommend it for hog pastures, but the cows will get into it, and I have noticed in the receipts of milk that if they commence to eat it gradually, that is, feeding rape gradually and where the milk was cooled down properly, it was not so noticeable. I believe the cooling of the milk is as much a deodorizer as anything, and it seems to me that that condition proves it. In the feeding of ensilage, if the cows are fed before milking, I noticed there was an odor of ensilage in the milk; but if after, not so much so. Also about the rye. Our farmers used it considerably for winter pasturage, and especially last spring they would allow the cows to run on the rye sooner than they ought to, but those who kept up the feeding of bran and hay at the same time and made this change gradually the flavor was hard to detect and not so pronounced, where it was cooled properly and where the change had been made gradually. My experience has been that any change in any feed, whether from green to dry or from dry to green pasture, don't make any difference if made gradually. I believe sudden changes give indigestion.

Prof. Erf.—In my former statement I want to say that the milk that was milked with the pounded rye was immediately removed from the stable. If you leave milk with this pounded rye it will absorb odor. In regard to the cooling that Mr. Spies brought up, cooling does not deodorize the milk. Probably one of the best illustrations I could give you is by sitting a piece of limburger cheese down; you can't smell it, but warm it up and you receive a decided odor.

Mr. Sawyer.—I think the professor is off, not on the limburger cheese, maybe—he may have had experience. But I don't want the idea to go out that the dairymen cannot very greatly improve milk by very rapid cooling as soon as drawn from the cow. That, in my opinion, is the way of getting rid of something that you don't want and by always doing that if you get into a scrape you are getting out of it. The feed question, on the other hand, I think nine-tenths of the difficulty is in sudden changes of feed. The animal gets out of condition and her milk will be out of condition, and by feeding clover and rye if a cow is pretty well fed with dry feed first and then goes to green feed she will gorge herself if



she is famished. The trouble with nine-tenths of the cows is they are hungry and will fill up suddenly and the trouble comes.

Mr. Glover.—A year ago I was called by a certain farmer to his place who had a sick baby, for they seem to think I can doctor babies as well as cows. I went to examine the trouble and went into the herd and knew what the man was feeding—10 to 12 pounds of corn meal, and not a cow but what was out of order. The illness of the baby was caused by the illness of the cow, which was not producing healthy milk. He changed to condensed milk and today that baby is a nice looking boy.

Mr. Latzer.—Was the cause due to feeding too much or changing too quickly?

Mr. Glover.—He fed altogether too much corn—10 or 12 pounds corn meal alone, not mixed, and fed 40 pounds silage and all the corn stover they could eat. A corn ration and when feeding corn meal alone that should have been mixed with hay to mix it up. It seems to me that was the cause of it. They had been on that ration and this was in June when I was consulted about it. Feeding too much corn.

Q.—It is not enough to merely place feed before the cows, but it is the farmer's duty to see she has enough and not too much, you mean?

A.—Just has two feedings.

By the President.—The fact I brought out in my address is we should have this gentleman go 'round and give lessons on the farm. We get it in our papers and it goes to a few hundred of farms and many never hear a word of it.

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## MAKING THE BEST GRADE OF MILK.

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Address by H. B. Gurler, DeKalb, Ill.

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Mr. President, Ladies and Gentlemen:

I don't know whether the Secretary put that just right, "The Best Grade of Milk." Perhaps he should have put it "A Better Grade of Milk." We cannot all get up to that standard of making the best grade of milk;

can't all get there at once, sure; it takes time. It took me a long time to get where I am, and I don't say I am making the best grade of milk.

Well, to start this, there is no question but that the public are demanding a better grade of milk than they have been getting; the consumers of milk are demanding this, and the creamery men are demanding it. I don't know whether I ought to say demanding it; I don't know that you are quite demanding it. How is that, Mr. Long, you would demand it if you were sure you could enforce your demand?

A. Mr. Long.—That's right.

This is a tremendous subject; I feel lost. But there is no question but that there are many dairymen that think they are doing fairly well, that are way off in their work. They don't know what a poor grade of work they are doing. There is great need of instruction along this line here; a great field for our experiment stations for such work, and Mr. Glover is doing this in the northern part of the State, getting them interested and teaching them the errors of their ways.

Many of us started in and got into a rut and doing things the way we were taught, and keep right along doing it, and some of us don't want to get out of this rut; would rather keep on doing work in the same old-fashioned way. It is a question whether you are going to whip them out of it, or whether you are going to lead them out of it and put conditions in such a way that it is to their advantage to get out of their old ruts.

I made a statement one time at a meeting, that we were consuming more filth in our milk than any one article of food. Just think of that! It is deplorable. But there are many dairymen, as I said before, that do not realize that fact.

Is Mr. Fraser present? I would like to have him tell us some of the results of their work?

Maybe Mr. Erf will tell us? Can you tell us what you discovered under the udders when they were unwashed and dirty, and the conditions?

Prof. Erf.—That is a topic that is too large to handle here. But under the unwashed udder we have at least 3,000 bacteria. We have some charts which would illustrate this much better. The same is true in feeding before milking and feeding after milking; that is, allowing the stable to air out and allow the dust to settle before milking. And then

we made another experiment in the way of illustrating to students here, by milking with the dry teat, or moderately dry, and milking with a milk teat; that is, allowing some of the milk to be washed off an unwashed udder and allowing to drop in the bucket. It is terrific the way germs reproduce themselves. I cannot hardly express it. I would be glad to bring up the charts some time and show you.

Mr. Gurler.—I just wanted some of these facts brought out to show the ground for the public demand for a higher grade milk, and when we can bring that about we are going to increase the consumption of milk very largely.

We are not all going to get to the front, although there is room for us all, but we can do better. I hear the complaint among creamerymen every time I go among them. The trouble is the milk is off and the butter is off, and they will have butter rejected, which means a loss to the creameryman and a loss to the patrons and works more mischief than you can calculate.

Now the greatest trouble lies in the faulty construction and care of our cow stables, and there is no reason why this should be so. It is not a very great expense to have a sanitary cow stable. The expense is not very large of putting in a cement stable floor with the cement all throughout the gutters and platforms and mangers. The stable over here at the University barn cost 11 cents per square foot, finishing the whole surface of the gutters and the mangers. Now I have in one cow stable a cement floor, 64 cows on 3,600 square feet, that is practically 60 square feet per cow. At 11 cents a foot would be \$6.60 per cow for the cement work. We can put in a wooden stall of some of the improved stalls—the Bradwell or Hoard's Model Stall, that are not an expensive stall. But here is one thing you want to keep in mind all the while, that is one of the curses, you line the cow up on the manger, when she should be lined up on the gutter. The stall should be so constructed that it can be adjusted, the front should be adjustable to keep the cows lined on the gutter. This is necessary, if you are going to keep the cow reasonably clean, without some one in the barn all the while to look after the droppings and keeping the cows clean.

One other point I want to speak of here and perhaps it is not strictly

in line, but one of the worst features of a stanchion is the danger of one cow stepping on the other's teat and inflammation setting in. I am sure that I have lost more parts of udders in my dairy from that one cause than all other causes combined. That is enough to condemn the stanchion, let alone the sanitary side of it.

I don't believe, Mr. President, it is hardly necessary for me to describe my work.

Mr. Campbell.—I would like to have him tell how he makes his milk.

Mr. Gurler.—I don't want to blow my horn; I have told it at these meetings several times, but am willing to tell you what we do. I will go over it as briefly as I can.

I would say this, I started that enterprise at the suggestion of some of the leading physicians of Chicago, and they worked with me a year and a half before they convinced me it was a safe enterprise to embark in.

After deciding to go into it, the first move was to work over my cow stables, putting in cement floors and fixing the ventilation, etc. I used the King system and plenty of light. My stables I utilized there by putting in more light and cement floors. Well, after I got my stables ready and had built me a little milk house, the next move was to have my dairy tested. I had the State official apply the tuberculin to them right there. I did not know where I was going to land, because we had no figures to show what tuberculis serum there was in the State, but I got off with only three per cent loss. One reason was I had been applying the test for several years and weeding out poor cows. I started at 200 pounds of butter, and I worked out my poor ones and elevated my standard and kept weeding out until the last years I run my dairy for butter making, they averaged 300 to 305.7 pounds per cow, counting everything old and young; everything I milked.

I think that process of weeding out the herd saved me, because I had innocently worked out some of the bad ones. If a cow could not get up to the standard, I sent her to the butcher and that was the way I escaped so easily.

My stables were all whitewashed twice a year, and now I have adopted the rule that all the stables shall be whitewashed the first of every month, and it is considered part of the work to do that once a month.

Now in milking, the cows are groomed a half hour before they are milked. That leaves time for the dust to settle. Then the milkers are required to go and cleanse their hands thoroughly and put on their white suits. We milk into a pail which has a strainer on top consisting of two layers of gauze and one layer of absorbent cotton, and we put all of the milk through that. Just in advance of the milkers is a man who goes around and cleanses the udders with a pail of water and a sponge. Here is a point I want to mention that is interesting to me. In my early practice, I had each milker go over his row of cows before he commenced to milk. The work was small, and I had only put in a portion of the herd into this sanitary stable, or, rather, into the certified milk work as we needed them. I found every time a cow went into that stable there was a shrinkage in her milk. I did not know what had happened. Finally a mother gave me the idea. That manipulation of the udder stimulated the secretion of milk, and to get the best results you must work with nature and follow up that stimulation of the secretions which had been caused by the manipulation of the udder. If you lost the benefit of that manipulation and the cow settled back, you had to pay for it in a small flow of milk. I changed then and adopted a plan of having one man cleanse the udders for ten milkers. One man can do that. Just go around and keep just ahead of the ten milkers. It keeps him busy all right to do that, but that shrinkage of milk all ceases then. After the milk is drawn it is taken out of the stable and emptied in a can, and as soon as the can is filled it is taken to the milk house, and there the milk is put through a centrifugal separator. That is to standardize the milk. This milk is used for infants' food and the doctors wanted to modify this milk; they needed to know what the standard of the milk was, so I adopted the standard of 4 per cent fat with the Babcock test. By using this centrifugal separator, if the milk is above 4 per cent we can cut out a little cream. It was not up to this standard for the first three or four years, and we had to catch up and raise our standard. It used to run 3.6 and 3.7, along in there. I have been weeding out more cows, not particularly with the idea of raising the standard, but weeding out the unprofitable cows and at the same time I have raised the standard of the milk until the milk of my whole dairy

is running 4.4, and we have to take out a little cream to fetch the standard down.

We also put up cream with 16 per cent fat to be used with this 4 per cent milk in modifying. You will all think 16 per cent cream is a low grade, but I do that at the suggestion of the physicians, because it figures so nicely with the 4 per cent milk.

Now this milk, after going through the separator—I will say now that I never thought at that time of the separator being any advantage as a clarifier, my sole thought was to standardize the milk, but I have learned this: The separator does take something out of the purest milk that I can make. I believe it is to the advantage to have it taken out. There is something that we get out of that milk that we ought to. What I get out of my separator don't smell like you get at the creamery. It is just that kind of a pasty stuff which is better out. From the separator the milk runs over a Star cooler. We cool down as low as we can cool with ice water in the summer time. At this time of the year we use the well water. After going over the cooler it is put into bottles, and the bottles are sealed with a metal cap and seal, on which we stamp the date the milk is bottled. That is a guaranty to the consumers of the age of the milk. Then the milk is put into cases and the cases are filled with chipped ice in warm weather. In cool weather we don't use ice in the water that we use in cooling the milk. In the warm weather this cooling goes on in the cases until it reaches 35 degrees, and it will reach the city at 35.

The record the milk has for keeping qualities has been a surprise to me. I was surprised at being able to ship that milk to Paris, 17 days on the trip, and it was good for four days after it arrived. And that was in August. I never would have undertook to do that, if the gentleman who had come to make up his collection of exhibits, hadn't asked me to do it. I felt just stalled at first. I finally thought if he had faith enough in me, I ought to try. We went to work, but we did not take any extra care of the milk until it was bottled. We did not know what cows the milk came from nor what milker milked the cows. No attention was paid to it, until the milk was bottled and put them into chipped ice and salt and cooled it down as rapidly as possible. That is all the pains I took with that milk.

The other day I was in Ira Mix's office and he has been putting in some pastuerizers. He thought it was the best in the field. He had been having some of his pastuerized milk brought to the office and had them sitting on his desk, and he asked me what I did to my milk to make it keep longer than the pastuerized milk. I mention this just to show you what it is practical to do. You don't all need to go to the expense or take the time and trouble I do with my milk, but I will tell you, there are openings all over this country to do high grade work, higher grade than is being done at present. There are people who are willing to pay you for it as soon as you convince them you are interested in your work, and establish confidence between you and them. You have got to convince them you are going to do this work and you will be paid for it. You have got to stand on guard; It's worse than standing on picket line in the Civil War. I never had anything that nerved me up the way this does, to stand guard over this enterprise. I tell you it is hard to find men who will stand guard if anything happens to you. We all make mistakes. The trouble is to see troubles ahead; we can see a stone wall when we run against it. We need to see these things in time to get by them. I tell my men it is all wrong not to know it is wrong until it comes back from the other end. It destroys confidence, and confidence is the foundation of this whole work, and you must retain it; you cannot handle it with gloves on. You have got to have grit enough to do anything that comes along, and you have got to study all the time. I am studying just as much as I ever did, and when I am home my attention is all diverted to that enterprise.

Now, Mr. President, are there any questions on this work, for if there are I am willing to answer them?

Prof. Fraser.—Did you explain how we found the amount of dirt in those milkings under different conditions?

Mr. Gurler.—No, that is the bacteria side of it.

Prof. Fraser.—The way it was done was we milked the cow and then took a dish and put in the pail and held it in the same position and the milkers went through the operation for four and one-half minutes without drawing any milk. The udder was washed and this operation was repeated. This dirt was washed out in a small weighing tub, and this

weighing tub was weighed to see the difference in weight of dirt from an unwashed and washed udder. We had about 15 of each. The average amount of dirt from unwashed udder was 30 times as much as after it was washed. When the udder was just somewhat soiled, as udders usually are, there were 16 times from the unwashed to the washed. When particularly clean it was  $4\frac{1}{2}$  times as much. That shows the advantage of washing the udders especially when the udders are very dirty.

Mr. Gurler.—Now, in my first work for producing certified milk, I would not feed ensilage, not a feed of it, I did not dare to. I had experimented with silage and had made a high flavored butter. So we experimented all one winter. I had samples brought to my family from butter made where silage was fed and otherwise, and they usually picked out the silage butter for the best nearly every time. And now I find no trouble in feeding sound silage to my cows. You might just as well say dried fruit is better than canned feed. If you put up a silo as you ought to, you have canned feed and it is superior to dry feed.

Mr. Stewart.—You made a misstatement about the cows being tied up. Thirty years ago I built a barn, 80 cows, 6 feet for two, cement floor and had a drop. They were tied by the neck so they could go back and forward. The difficulty was they will not get rid of droppings because they go back and forward. Ayrshire cows have short teats and not long hanging ones. They would trample on those teats and hurt them. Three years with cement floors, and then put them in stanchions and put six cows in every sixteen feet. It isn't very close and I haven't lost as many teats off my cows as when three feet apiece or over. I have found the wider you have the stall the more apt they are to lose their teats.

Mr. Gurler.—You can account for it, the cow has got to lay down like I don't know what, with her feet all under her.

Mr. Stewart.—She did just as well and kept as well.

Mr. Gurler.—She seemed to.

Mr. Stewart.—I can't tell the difference.

Mr. Gurler.—Why not put in stalls, with individual stalls It may be a little more expense, but it is cleaner where you line up the rear in place of the front. It won't be more than \$1.50 to a cow and I don't know whether it will be that.



Mr. Stewart.—They are cleaner in stanchions than in stalls.

Mr. Campbell.—In 16 feet I have got 5, on the opposite 16 feet I have 6, and the ones where there are six in a row do not do as well as the ones with five in the row. They can't all lay down at one time and they take turn about and they have no regular rest, and I think the cow must have regular rest just as well as men.

Mr. Coolidge.—I would like to ask Mr. Gurler if he finds any difference in separators in respect to taking out this slime?

A.—I cannot answer that question. I have used the Alpha separator. I don't know about any other for that purpose.

By the President.—We will now listen to Mrs. Purviance of the Logan County Buttermakers' Association.

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## FARM BUTTERMAKING AND COUNTY ORGANIZATIONS.

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By Mrs. H. Purviance, Lincoln, Illinois.

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Mr. President, Ladies and Gentlemen:

I hardly know how to address such an intelligent audience, one that has so many noted speakers as have spoken to you this afternoon, being only a plain farmer's wife.

It seems to me that I might interest and instruct you by telling the things that have come under my personal observation and give you a brief account of Farm Buttermaking and Organization.

Dairying is one of the most profitable things a farmer can do, for several reasons. He has his corn, oats and grass. He desires to have horses, cattle and hogs, and perhaps sheep. Why not have cows and raise your calves, or, at least, those you wish. You can also buy calves very cheap and raise them all by hand, which is the proper way to do. Then you have the good warm milk to give to your pigs, provided you

have a separator, which you should have if you have not got one, for it will pay you to get one at once. You have all heard how the hog pays off the mortgage. I do not believe he pays it alone; I think the cow has as much to do with paying off the debt as the hog.

You all know there is nothing better for pigs than good slop, or warm milk, with shift stuff or shorts. Your pigs will grow faster and at less expense by using milk. Then your large hogs can run after the cows, saving the corn, otherwise you would have to feed.

While you are doing so many good things, see what the wife can do at the same time. Having all of this milk means plenty of cream, which can be made into good butter. Suppose you sell only 40 or 50 pounds a week, won't that pay the grocery bill and possibly the dry goods bill? With ten cows and taking a low estimate of six pounds to the cow, will make you 60 pounds per week. If you milk only two or three cows can you make as good butter? No, only by hardest work of the wife. Her butter will not score as high, from the fact that the first cream has too much acidity to mix with the last skimmings, causing a loss of butter, and her butter has either a flat taste or an old strong flavor. Can you afford to milk two or three cows? Just think of the advantages a dairy gives you. You have pure, sweet butter for your table and an income of \$15.00 per week from ten cows at the low estimate. A cow that makes six pounds per week will eat as much as one that will make twelve to thirteen pounds. Why not have the best?

Let me give you the experience of a couple I know. They began housekeeping. The wife made more butter from six cows than could be used at home, so she sent it to the store. At first she received 18 cents, but she found that eight to ten pounds per week paid for the groceries in a family of four. When they saw what a few cows would do, they decided to increase the number of cows, and at the end of the year found that their groceries and help in the house had been paid. Every year they gained, not only in number of cows and butter, but also in price, their butter selling at the highest prices, 20 to 22 cents at that time. This took them about four years, after which they delivered all their product to one merchant who secured customers at 25 cents per pound. At present they make 175 pounds or more, which they deliver to

private customers at 30 cents per pound. They also raise feed and sell from 80 to 100 head of hogs; feed from 15 to 20 head of calves the year round by hand. They also buy small calves and raise them on the skim milk, besides feeding the young hogs the surplus milk. If they sell only 150 pounds a week, see what that means? Will say in round numbers, \$45.00 per week worth of butter. Not so much, but think what a help, besides, you have your calves and hogs yet to make money on. Do you think it pays? This is a progressive age. We cannot farm as our fathers did, but we must be constantly watching every corner if we wish to succeed.

The man who puts a field in corn year after year soon has his ground worn out, with only a small yield for his labor and expense. If he raises cattle and hogs for his own use only, he has to sell all the grain, so all that was raised is taken off the farm. On the other hand, if he raises horses, cattle and hogs for market, he has to feed the grain, thereby furnishing himself with an abundance of the best fertilizer known, without resorting to the expense of commercial fertilization. He has more pasture, his ground is constantly being rotated, and his soil is in fine condition to yield him a large crop.

I know it means work, and you have to pay the closest attention to this work if you make a success.

I do not think it necessary to go into detail as to how you should keep your cream, the temperature, etc. You doubtless know much better than I do, but if any one has a question, I will gladly answer it to the best of my ability.

One thing I do wish to say, if you go into the dairy work, you want to study every point. Remember that only good butter should be made and sold. I shall be glad when all shall be sold on the scoring system and the price paid according to the score. I think that pure butter is as essential as any food we eat; really more so, as it absorbs all of the impurities, if not properly cared for, or packed in the best of packages. You cannot afford to make or sell anything but the best. Your reputation is worth more than money, for with a good reputation you can soon have the money.

With plenty of cream, you ought to make gilt-edge butter. Do you do so? If not, why not? Have you tried to find out? If not, get some good judge to score your butter, and find out where your weak points are, and then rectify them. Now, if it scores low, do not get angry at the judge, as so many do. They think they know all there is to be known, and as a result, make the poorest butter on the market.

There is a growing demand for butter, and producers find they must have a pure article, if they find ready sales and top prices.

We have gained one good point over oleomargarine. Let us do still more, by increasing the number of dairies, until we supply the market with good, sweet butter, and drive oleomargarine entirely out of the market. It can be done if we will only stand together and work.

Here is where our organization can do good work. Let each county have an organization; let them have meetings and discuss the various points on butter making. Let them have butter shows and give substantial premiums. In some townships there may be better buttermakers, who have better facilities. If so, throw them into classes, as we have done in our county.

Let me give you briefly an account of our own organization. When the Logan County Farmers' Institute was first organized some fifteen years ago, there were half a dozen men who attended. For several years the attendance was light. About the fourth or fifth year, one or two ladies were present, and were laughed at for going. About eleven years ago the managers decided to have a farmers' exhibit and a woman's department in connection with their program. That year they had an institute. We held our meeting in a large hall. There was a fine display. I do not recollect about the men's department, but I do of the cakes, bread, butter and chickens, especially the last two, for it was hard to decide which would win the day—the crowing rooster or the strong butter. The roosters won and were banished. But that butter! It had all the colors imaginable, and all the flavors of the cellars and kitchens. We had forty-seven entries in butter, and all became the property of the merchant who gave a premium of \$5.00 in merchandise. He made the same offer the next year, but received only 25 entries. There was a decided change. People had learned that they must not have an orange

yellow, neither should it be white; that butter had grain and it should not be churned too long and that it should be washed.

At that time there were a number of farmers bringing butter to market, receiving from 12 to 15 cents. The merchants were constantly complaining of poor butter. Four years ago we organized a butter association and have had our butter exhibit in connection with the Farmers' Institute.

At first we all thought of entering in one class, then decided that to give all a chance, we put separator butter in one class with first and second, and township in classes to themselves, making a first and second premium for each township. Sweepstakes for highest scoring butter. The first year we had thirty entries. Some good butter and some that scored but 70; second year we had 42 entries, and by far better butter in every respect. The sweepstakes scored 96½ and the lowest 78. This year we had 54 entries; sweepstakes 95 and lowest 86. It was gratifying to see how eagerly the people examined their score card to see what progress they were making.

This year our merchants told us that we had driven the poorest buttermakers from the market, but more butter is brought in at present than formerly and of a much better grade. Why not keep the good work going by organizing every county, and secure the best butter for market. We can make as good a score as any creamery butter, if we try. I claim better than butter made from cream handled by so many different people; some are careful, some not.

I expect our brother creamerymen will differ, but I believe we can do it. The time is not far distant when dairy butter will rank as high, if not higher, than creamery, and will get the same price. That is the case now in Lincoln with many people. They prefer dairy to creamery butter. There is no such a marked difference, as dairy sells from 25 to 30 cents. We mean to increase the number of dairies in the country to show the farmers what they can make by going into this work. Sangamon, McLean and Logan counties have organized and are doing good work. That is what our State Dairywomen's Association is striving to do, and if we only have the encouragement from the State Dairymen in a good cause, we will succeed. We cannot make too much good butter.

In behalf of our Association, we thank you for giving us a place on your program, that we might have a chance to show what we are doing. It is to the interest of both Associations to work harmoniously, for we can accomplish much more thereby.

### DISCUSSION.

By the President.—Is your Association the oldest of the three counties?

A.—No sir, Sangamon County is older.

Mr. Glover.—Has your Association ever calculated how much time is wasted on the different farms in Illinois churning? To explain my question. We were making a visit in the country and went to a farmhouse and found a lady churning; said she churned from three to four and a half to six hours on one churn. She said she never got it in less than two hours and it usually took to three o'clock in the afternoon to complete churning. Have you ever estimated the amount of time that was wasted?

A.—I think she could have saved a good deal of time by commencing at the bottom and learning how to make her butter. It doesn't take three hours to make your butter, if she knows the temperature and the way to make it and manage it from start to finish. There may be a great deal of time wasted. I never studied it.

Mr. Glover.—They usually use their fingers for the temperature?

A.—No, a thermometer.

Mrs. Purviance.—How many ladies have you seen test it with their fingers?

Mr. Glover.—Ask me how many test it with a thermometer. I haven't seen many ladies using a thermometer. I usually find that system. They shake the milk, push it off into a dish and dip in their finger, and I think that is pretty much in vogue. The milk was on the back of the stove and felt once in a while.

Mrs. Purviance.—In Logan County we are up-to-date. In some counties that may be so.

By the President.—I want to state before we close that a reception has been arranged for us at the dairy barn, and we can only spend a half an hour there before going to Prof. Erf's to learn how to use starters.

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Appointment of Committee on Resolutions:

By the President.—I appoint Mr. H. B. Gurler of DeKalb, Mr. L. A. Spies of St. Jacobs and Mr. George Caven of Chicago as a committee on resolutions.

Mr. Gurler.—I cannot stay with you. I have to go home tomorrow forenoon. I have been in Chicago about this organization of the milk shippers and it is compelling me to reorganize my shipping, so I will have to be there to look after it.

By the President.—In place of Mr. Gurler, I will put Mr. John Stewart of Elburn, Illinois. So the committee on resolutions will be Mr. John Stewart, Mr. L. A. Spies and Mr. George Caven.

Appointment of Committee on Nominations.

By the President: I appoint Mr. M. Long of Woodstock, Mr. F. W. Belden of Aurora and Mr. John Coolidge of Galesburg as a Committee on Nominations.

## *Reception in Cow Stable*

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*University Barns, January 6th, 1903*

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By the Toastmaster, Prof. Fraser.—This may be the first time you have attended a reception given by the cows, and I hope the cows will prove good entertainers, if that is the case.

Across the water they think nothing of this kind of thing; they think as much of their Holstein cows as they do of their families. These ladies you see on both sides of you here and who are very glad to do you honor this afternoon, and I think some honor should be shown them. If there had never been any cows, we would have had had no Illinois Dairymen's Association. The chief object in their inviting you up here this afternoon is that you may remember that their home is a place where food is produced, the same as the home is, and if it is a place where food is produced, it seems quite proper that it might be eaten there as well.

We have with us today a man who has done more toward making the cow stable a sanitary place than any other man, and we would be glad to have Mr. Gurler respond to the toast, "Why Not."

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**WHY NOT.**

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**By Mr. H. B. Gurler.**

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Mr. Toastmaster, Ladies and Gentlemen.—I need not tell you that it is not my forte talking in a place like this. You will discover that. This



toast, "Why Not," is a little suggestive, but why not? Why not have this kind of a gathering in the cow stable, when the cow stable is in such sanitary conditions that there is nothing objectionable? And why not elevate the whole business, why not do it? You can't get up to the standard they have gotten here all at once, but we can go gradually, step by step, until we reach the point where the cow stable shall be in a condition and a fit place to prepare all the food we eat. I would just as soon have my pancakes prepared in a cow stable as my milk. No article will absorb the impurities quicker than milk will. A cow stable should be in such condition that we can entertain our company, our lady friends, any one we wish into it, the same as we are doing today. There is no reason in the world why we should stand back and hang back and not try to do better than what we have been doing.

I can't do this subject justice; I can't tell you all I feel along that line. You will see here what has been done. It takes time, of course, to do it. It has taken time to do this here; it has been several years in developing. Things were not in this condition when I was first appointed a representative on the Dairy Board here. I used to feel I was sat down on when I got something done on the dairy line. But I am proud of it today and shall remember this as long as I live. That is all I have to say. (Applause.)

By the Toastmaster.—Dr. V. P. Burrill, our Vice President, has been kind enough to come out this afternoon, and will respond to the toast, "Caged."

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CAGED.

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By Dr. V. P. Burrill.

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Mr. Toastmaster.—I haven't finished my lunch, but it wasn't because I was afraid of it.

I remember some time ago in our College paper managed by the students, the statement was made that "The very hairs of our head are all numbered," and under that another little, "Some of our professors have only the back numbers." I keep on my cap.

We have vague ideas about cleanliness. The good housewife scrubs and polishes and makes things bright and fine, but sometimes in doing this she uses what is called a dishrag and after she has done with it, she puts it up until it is time to use it again, and then goes through the same operation.

The chemist thinking he can do better, fixes his kitchen utensils in better shape. He washes and scours and then turns in acid and various other things to get off the last remnant of dirt, and he has thought he was doing excellent work, and possibly some one comes along and remarks in each of these cases that great pains has been taken to do certain necessary things, but the very particular, necessary thing has been left out, and we have been leaving that out in a great many of our operations and affairs.

Perhaps it would be unwise to point our particulars near at home, but in the old world in the middle ages, in Europe, one-third of the total population of that whole European country was swept off in one year by the plague. In London the bodies of people, so many of them were lying in the streets and in their houses, that those who were left could not take care of them who had died. The whole atmosphere became tainted with the contagion and it was impossible that burial should take place fast enough to keep up with the deaths. This same kind of thing would have prevailed and in our own country, but for provisions that this other country did not have; information that these people did not know.

I do not think our people work any harder or are any more particular in their modes of life than the people before them. These good housewives are doing the same things in keeping the rooms, tables and dishes clean, but after all, in a great many instances we are leaving undone the thing that leads towards cleanliness, that we ought to look after.

I believe this is the first time in American history that a fine luncheon has been served with such attendants on either side. The natural idea I suppose would be that the place was some out of joint, but I tell you if

we will only meet the real issues, we can be perfectly safe in eating here; our milk as free from taint as it ought to be, and in all probability the barn will be a place for this kind of thing.

I have been announced to talk on the topic of "Caged." Put these living, active organisms into some kind of position where they can't get out; put them out at one side behind the bars and we shall adopt the essential feature of cleanliness in regard to health.

A little time ago in our southern countries, if we would go through New Orleans and many cities nearer than that you would get a strong smell of carbolic acid around the streets. Apparently they thought they were destroying the germs of yellow fever, but they were not doing what they ought to have been doing. They ought to have been attending to the mosquitoes; catching the mosquitoes which carried the disease. And we too, if we did these things which ought to be done under the circumstances we could have the most excellent cleanliness here with the cows just as well as in the scoured kitchen or parlor, with the upholstered furniture full of dust, or with the dust beaten out occasionally. Indeed I don't know but what things are more favorable here. I don't know as we will ever set the fashion of making the cow barn the dining room, but I do believe that we are coming to the time when the products of the cow stable shall be fit for the dining room.

By the Toastmaster.—We will now have a picture taken.

By the Toastmaster.—Our Dean needs no introduction to an Illinois audience. He will respond to the toast, "Room at the Top."

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### ROOM AT THE TOP.

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By Dean Davenport, Urbana.

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Ladies and Gentlemen.—Really there is nothing remarkable about this matter after all. I noticed the people as they came in.

some of them grinned a little out of the corners of their mouths; others stuck up theirs just as if they had done it before—just like the young fellow who was married for the first time.

Here food is made 365 days in the year, and I submit the general proposition, that if this is the place where it is fit to manufacture food, it ought to be fit to eat it in; if not, it ought to be.

On "Room at the Top," there is no question about it in this business. It is true of all agricultural work. It is a good deal like a two-story building. The most of us go in the front door, inquire for the cellar and go down, but there is more room on top.

I am bound to tell further that we must commence to realize the upward bent of the dairy business. In this connection here, let me assure you, lest you get a wrong impression, that these men who have served you are the milkers in this barn and the men who care for the milk. And assure you further that this business that you see conducted here, is done every day—except this part of it, that don't pay. The milk business is profitable here now. The State of Illinois is not sinking money on any of these cows you see here. If this is true, if the traffic will bear it, why not more of us realize it? I admit there are barns where milk is made that we wouldn't care to drink. I do not want to eat the products made in any barn I would not be willing to partake of in it. There is more room at the top than we realize and the road upward is not so hard to travel, and you can get after it better. The fact is we drifted along, so to speak, figuring all the time how little we can put into this business. We must take into consideration that since cows have been milked, this great population has been increasing too. There are more people than there used to be, and more people who have money to spend.

What has been done here has not been easily. All you see here in dairy husbandry, the cattle and the farm is due to Mr. Fraser's work. I wish you could know Mr. Krouch, who is head herdsman here. All this business needs his sticking to it with determination of getting at the top. There is too much bad butter and filthy milk that ought not to be. There is room for better things and I hope that we will lead in the business of getting nearer the top.

This business needs more than anything else, good sanitary condi-

tions, and we must get after this thing to improve the conditions and satisfy the people that dairy products are sanitary as well as acceptable.

I am not going to occupy your time any longer. We have had our refreshments, warm milk or cold milk as you pleased, and as far as I am concerned I am going to stop. I hope this Dairy Association while it is here will see some things and do some things that will boost this business farther, for their needs are infinite. There is plenty of room at the top. There is a crown just over us if we look up. Let's get a little bit of the money the people are spending; let's get a little more in the dairy business.

By the Toastmaster:—

We have stayed here as long as we should. Maybe I should mention something about our cows. The cow on this end goes by the name of Rose. You can see her record, and it is very good indeed. We have some experimental cows at the other end and more interest connected with them probably. I shall be very pleased to tell you more about them and spend any time with any who cares to come out here, but at present we have stayed long enough and had better adjourn.

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## ***Tuesday Evening, January 6th, 1903***

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President in the chair.

We will now listen to Dean Davenport, who will talk to us on

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### **AIM AND WORK OF THE DEPARTMENT OF DAIRY HUSBANDRY.**

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Mr. President and Members of the Association:

I am going to undertake this evening to follow the thought in the program as closely as possible and speak of the aim and work on this depart-

ment, and getting before us the real purpose that animates this department.

That first word, the AIM of the department expresses a thought that comes before us when we undertake to settle policies; determine what shall be done in the way of investigation. The work was discovered before Mr. Glover went into the work in which he is engaged. It is very much talked about. What are we trying to do with this department. One definition is that the department of dairy husbandry exists here for the purpose of doing all it can do for the dairy industry. It is that definition which led us to separate the department of dairy husbandry from the department of animal husbandry.

I don't mind saying to you, we had some difficulty in separating them. There are some places in which husbandry and animal husbandry are covered by the same department and often by the same man. When I first advocated a dairy department as a separate department, and at that time I held the department of animal husbandry myself, this question was raised: Why should there be a separate department for dairy husbandry? Dairy husbandry means the husbandry that is based on the cow, and the cow is an animal, therefore of course it is a part of animal husbandry. The first idea of the dairy department was a department in interest based on the idea that the manufacture of dairy products was not animal husbandry.

By and by the time came there should be a separate department for dairy husbandry, because dairy husbandry is a distinct business. There is no more connection between dairy business and the business of feeding for beef, than there is between it and veterinary surgery.

It appeals to a different class of men; it has interests of its own and we have established this department and started those things that have established this department and started those things that have to do with the dairy industry. That makes it logical for us to say we have the means in this department of teaching the dairy business; for the profession of making a living by means of the dairy business. We differ a little from some, who hold that part of the business is to teach individual students their business. We believe here that it is the first business of a department to stand for the industry it represents, and, secondly, their business to teach individuals, but to work for the industry is the first object; to work for the individual is second. I don't believe the department

of the dairy husbandry should be principally and solely for the good it might do to the individual student who might come here. I believe it is established here in order that dairy husbandry, beef cattle business, management of soil and all of these agricultural professions, can be carried on better in the State of Illinois. The State gets a benefit out of the individual, and so I think it is only fair to put it this way. Mr. Fraser, Mr. Erf and Mr. Glover, the three men especially connected with this department, their first object is always, and always has been, to ask and answer the question, "What is the bearing on the dairy business." If they teach either successfully, and carry on experiments successfully, why it is bettering the dairy business.

This gives me the opportunity to say, that with that point of department settled, we outline our work. For teaching purposes here, we recognize first two distinct different classes of people. There is first of all—not because most important but because mentioned first—the dairy farming. We make a distinct separation for teaching purposes, in outlining our course of study, the business of producing milk and the business of manufacturing products.

Prof. Fraser, who teaches these subjects relating to milk producing, he offers a course of dairy cattle, the animals that are suitable for milk production. He offers dairy farm management. He is not asked what the rest of us teach. He discusses the question of stocking and managing a dairy farm; whether the cows shall be bought or bred, and if bred, how bred; how feed silage to the dairy herd. Perhaps in the same hour, in another floor, Mr. Mumford is telling the beef people about a silo. He has a course in milk which lasts a full half year, in which he discusses the nature of milk and the economical production of milk and the care of it, the testing of milk in order to test the cows, and this milk question is based on the dairy farm side of things, because the dairy farm was handled there and deliver it to the man that manufactured something out of it. If it is not properly handled and delivered to the consumer, that has been a failure. They study dairy bacteria for the sake of the milk production on the manufacturers side for the sale of men who shall take the milk and make something out of it. These courses are outlined and taught by another man, Mr. Erf, who

presumable knows nothing about cows. He is not responsible for cows at all. He is not to be asked about the best way to produce milk; he is not to be asked these questions at all. He is supposed to know about making things out of milk. After the farmer has delivered milk into his hands, it is his contract to teach students how to make cheese and butter and dairy productions of all descriptions. So he conducts a course of study on testing, separators, pastuerizing, butter making, curing of Cheddar cheese, fancy cheese, and miscellaneous dairy products which are distinct course, a separate course of study from all these others. Attention is given to the city milk trade, which of course may, or may not be, conducted by the milk producer. Students enter these courses without any reference to other work in the college and without reference to other work in this department.

For instance, here comes one man who is a buttermaker, he wants to know first of all how to make that butter. If the milk was always properly delivered he would not care about his production, but from the fact that it is not properly delivered, why this man is likely to concern himself very much indeed with the product of milk. On the other hand the dairy farmer may not care to take time to learn how to make butter. The student takes such course as he will best serve his purpose. All of our agricultural students may take this work. As a matter of fact there are several taking this work today from other departments outside of the dairy department. I have a young man who is in the college of literature and art, and he is taking one study in agriculture. This dairy work may be taken by any student in the university. It is just as he pleases. He may spend years, weeks or days with us. We offer enough work to take a man more than seven years to take it all. We have between eighty and ninety courses if he cared to take it all, but, of course, no one cares for all of this.

So I say it is just as wide open as we know how to make it. What are the things that some one wants to know? We list them down and teach them each one separate from the other. A man may take milk testing here with us and nothing else; cream separation and nothing else. He may make any combination he pleases, with a single exception. some things must be taken first. He cannot take, well, cannot take butter



making without taking testing of milk first. Dairy bacteria too must be taken.

Now there is a class of work that this department is doing that some of you know a good deal about. The field work that is in Mr. Glover's immediate charge. I don't know whether you want to call it investigation or teaching work. I call it both. The surest way of teaching a thing is to go where the fellow is. I am one who believes the most direct and the quickest way to influence the people of the country is to go into that country and work with the men in that country; work things over, and get into the problems as they are on the ground; tell this man one thing, ask him another; work together. The world was not made in a minute, and evolution is slow if good for anything.

This field work that Mr. Glover is doing is eminently instructive work. Call it by any name you please; it is both. Mr. Glover in his field work is learning lots of things and teaching some things I think. We are getting a good deal of information from his reports, and many of the dairy people are getting information from him. He acts as kind of a clearing house too. He asks Jones what Smith is doing, and Smith what Jones is doing. He is able to offer a hint there and catch two at the other place. We regard them both as investigation and teaching work. It is not intended to be understood that he has been sent to the northern part of the state to tell them how to do their business. He has gone there to make certain investigations of dairy conditions. He has gone there to learn all he can and be helpful, and he has been, I am sure.

This work is on the investigation side pure and simple, on the side of getting information not yet in existence in order that we may know we have been carrying on certain lines of investigation. All experiments at first are slow and results are hard to obtain. We have got to be careful in the new things we learn, that they shall be true.

If anything Mr. Fraser is conservative in, it is getting at new things. He set himself to ask and answer a few questions in the dairying business. He has not attempted so many things, and I ought to say that the investigation work of this department is in Mr. Fraser's and Mr. Glover's hands, because Mr. Erf has not been able to get on in investigations on account of lack of funds. Mr. Fraser has settled some things

connected with the raising of calves on dairy farms. A calf needs milk and Mr. Fraser can tell how much a calf needs. He has made a bargain with the calf that the calf can be raised on a certain amount of milk so well that the dairymen ought to be willing to give it to the calf. I think raising calves on the dairy farm is practical. I have always wondered where all the cows come from. I never was acquainted with men with cows for the market. I guessed they were born by accident and bought by design.

Mr. Fraser has spent time in the study of the deficiency of the individual cow. It has been a favorite saying that there is not much difference, if any at all, in the use that different animals will make of the same food. We all recognize the fact that some cows give more milk than others; that cows which give the most milk eat the most feed. Some of you know he has shown by several investigations that there is a ratio of 2 to 1 between cows eating the same food and the same amount. If it is true that some make two times as much out of 100 lbs. of feed, why we don't want the other cows. Some cows, as I have said before, make twice as much as another on the same food.

Mr. Fraser has bestowed a great amount of pains on this subject. His work commenced years ago. He has wasted barrels of gelatine in experimenting to discover where the bacteria came from and what must be done and he has an amount of information that is somewhat appalling.

These three lines have been especially followed out here. When Mr. Gurler went to the northern part of the state, it was with the special purpose of learning all that could be learned of the actual dairy conditions up there, and especially to make a study of the individual cow in the dairy herds. It was to work out methods if we could from data in the field for improving dairy conditions. There is not time here, and perhaps it is not the occasion, to say all that has arisen out of this work. But this may be said that there is nothing clearer to our minds than this: That there is very very much indeed that can be done to improve the conditions of this profession.

Generally speaking it can be divided into two lines. One is something or other which will wipe out from the dairy business all that is

below what you may call a line of safety. There are barns, places where milk is produced that are intolerable. We want the Dairy Association to do something about it. There are some people who are not only disgracing the profession but injuring your reputation and taking the money out of your pockets. I read of Armour Company trying to get possession of a lot of creameries. Why do they want creameries? I believe it is the result of the study of these conditions. I believe the dairy people should do something to free the profession from its worst features. I don't mean those features that come into the business because of individuals who belong to this Association, but the hangers-on that are hitched on to this profession, who ought to be got rid of. I am talking plain because if you knew as much of the inside of this situation as well as I do, you would not hesitate a minute to see that they were sidetracked. The dairy profession needs this thing. It needs a system of inspection that will inspect.

Our investigation work not only in the field, but in work that Mr. Fraser has done leads to this conclusion that the dairy profession, as well as the public, needs an inspection that will inspect. I think I will have to stop. I have tried to bring out this point that we are teaching those things that will be the most helpful to put the dairy profession ahead. It ought to go ahead, we all agree on that. It ought to have greater development than it has today, and it will have in the near future. Cows must be better in order that milk be produced cheaper. It must be cleaner in order to be higher priced. Let us use the influence we have and seriously act upon the best judgment we have.

Before I stop, I would like to say, I have no desire to make you think we are doing wonderful things, but we have chosen to bestow our work on a few lines and on the lines that mean most to the business. You and we are to work together in this matter. We shall hang together or hang separately, we are all in the same boat; interested in the same things. Mr. Fraser and Erf and Glover are not working here simply for their own reputations, but working simply for those things that will make the dairy profession a little better and more profitable for those employed in it and the public through them.

You know some of this investigation work is carried on with money obtained by this so-called Bill 315, the one section devoted to dairying.

That has been the fund that has made this field work possible. The only difficulty with it is, the amount is small. We ought to have done more and had more money. We have done the best we could with what we had.

I must say a word for Mr. Glover. I suppose there are a good many of you who are better acquainted with Mr Glover than I am.. He only gets down here once in a while. I don't know whether he comes down here to get encouragement or to encourage us. I want you to realize that Mr. Glover undertook a job a little more difficult than any experiment station man ever did before. It is one thing to be connected with a work with twenty others in a situation, but it is another thing to go out alone, even among friends. He had to go out alone and get acquainted and introduce his work which no one knew about and few had confidence in at first. It was a difficult thing to do and he has succeeded where many men would have failed. The college is greatful to him for having done his work well under great hardships. I thank you.

By the President:—

I would like to ask if Dr. Russell is in the room?

No, he comes tomorrow night, and will not be here before tomorrow..

By the President:—

We shall have the pleasure of listening to a very pleasant speaker on "The Elements of Agricultural Science in Rural Schools," and there is not a better educator than the gentleman whose name is given here, Prof. F. H. Hall.

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## THE ELEMENTS OF AGRICULTURAL SCIENCE IN RURAL SCHOOLS

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By Prof. F. H. Hall, Aurora, Ill.

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Prof. Young of the Chicago University, who spent some years in studying educational problems in Europe, tells of a class of people that he found in Prussia that were called by Bismark, beggar graduates. He

says that an American resident of Berlin was annoyed by one of these men coming to him wearing a silk hat and kid gloves too big. When this common-sense American subject suggested to him that he had better go to work, he indignantly replied that that would not be in keeping with his social standing. What do you suppose Prussia is doing to diminish the number of beggar graduates? Having fewer higher scholars, less of those higher scholars that can't be employed in keeping with their social standing.

I do not think we have acquired that class in this country, and yet we have enough people who have been educated away from their industry, away from work, who have been so educated that their business is to receive, to take in the good things and enjoy them rather than to give to others. Not long ago the question was asked, "What would you do with \$460,000,000; would you establish libraries or found universities?" And he answered his own question by saying he would do neither, but would build free soup houses for educated people whose tastes are so that they cannot engage in ordinary occupations. So we have some of that class in this country, but we do not propose to diminish the class by refusing to educate. We propose to educate in a different way. We propose to educate toward useful activity.

It is estimated in a recent editorial in the Chicago Tribune, out of a total of 4,000 or 5,000 who are handling the litigations of the city, there is not enough law business to go around and the young lawyer who is not unscrupulous enough to make law business is obliged to eke out business by selling insurance and real estate on commission. There are estimated to be about 4,000 physicians in Chicago for a population of two million—a physician to every 500 inhabitants—four or five times more physicians than are needed.

I am going to read what Dr. Harper said to the graduates on graduation day. It has already been told here in Champaign, but will bear repetition. This is quoted from Prof. Harper himself in his address to the graduates. "You who are entering the world will find that poverty will be the strongest opponent to overcome. You who are about entering life need only to look at the papers of today to find the average lawyer does not earn his salt. Those who will become physicians will find for

the first few years that the hardest thing will be to keep the wolf from the door, while those who go to teach need only witness the struggles of the school teachers of this city. This school board is besieged with howls and wails for increase of salary. This is the address to the graduates. Mr. Kerrick at the dedication of this university said: "Do any of you think that Pres. Draper will ever say to our classes graduating from our Agricultural College, 'you have done your work well in the college, you are going out to the farms and you are well equipped for your business. We, however, felt obliged to tell you that poverty will be the strongest opponent you will have to overcome; the average farmer is not earning his salt; the only company you will have for some years is the wolf at the door.' I would as soon expect to see myself tomorrow sitting on some distant star reading that the cables of gravitation had parted and the whole planetary outfit had gone to everlasting smashup."

Dean Davenport read a list of sixteen applications for men as can be turned out from this institution before they can get them ready. There is an old education and a new one. By and by we shall find that the difference between the old and the new is not much, but includes them both. The new education at least is educating toward useful activity, and the great educators are coming to see that the way to educate is to educate for a purpose.

Now the commercial education is coming. The commercial high school is a certainty. It is not far away when we shall have it. The pupils will be able to stand—I mean our common schools—able to stand and look out of the windows that shall give them view of the avenues that lead to professional activity; look out into the avenues that lead to mechanical work, and still another to commercial activity, and a fourth to agricultural activity.

The young man starting and standing in that position will be invited to discover for himself which he is adapted to. I had not thought to tell this story, but I will tell it to illustrate the fact that young men under the old system of education did not discover themselves, they did not have the opportunity to find which they were adapted to. In the city of Waukegan lived a lady of wealth who a great many years ago adopted a boy 12 or 13 years of age. She thought to educate him. She put him in the Waukegan schools, but he found great difficulty in keeping

his place in his classes. She hired a tutor to stay by the boy and help him in his work. She helped him herself until he reached the high school, and then came the trouble with algebra and Latin. The boy did not like it, but was forced to take it. At the end of the first year he barely passed through his work into the second year of the high school. In about three months it became apparent he could not possibly do the work and he left school. The lady told me that she felt she could not give it up, the boy must be educated. So she took him to Evanston and put him in charge of the professor there. The boy stayed there about three or four months when he came home where he remained until the close of that year: At the beginning of the next year, this lady said she would not give him up, and brought him to Champaign and took him into these buildings where he could see the wheels turning and all the different departments. He appeared very much interested and turned and said, "This is just the place I am looking for." He remained here until he graduated, with average honor at least, and was immediately employed as a civil engineer, and was the last to be discharged, and before his discharge he secured a place on the great drainage canal, and while there invented a machine that took out hundreds of tons of earth. He would, you see, have been lost to the world under the old system of education. That is the kind of education we want, that will help a boy to discover for himself that for which he is best fitted.

It is a great comfort to those who have stood for those things to find the leading educators are saying kind things about what we believe to be the better education.

Pres. Harper says, "Instruction in agriculture in the rural schools is an application of the now generally recognized principle of bringing the school work into close touch with the home life of the pupil, and it may safely be predicted that no more important application of the principle has yet been discovered. The nature of the subject thus introduced and their pedagogical possibilities combine to make this step one of marked significance in the history of education."

Ex-Gov. W. D. Hoard says: "I want you to move with irresistible force and power toward the employment of the common school for teaching the elements of agriculture. You cannot do anything with the old

farmer. Something must be done for the young farmer. What shall we do? I thank heaven we have done something in Wisconsin. We have got the educational force of the state moving. We have got the State Superintendent enthusiastic and we are moving right along the line of enlarging the work of the teachers. You have a grand work in that line. You will do more for the young farmer, if you will take hold of the educational force of the state and look not toward the university, but toward the common school. As institute workers we must convince the farmer that the teaching of agricultural subjects in our common schools is a practical thing. He does not believe it. He stands firm as a post. The teacher does not believe it. You may ask why the boy leaves the farm and goes to the city? It is because it is a simpler life. It is twice as easy to make a success in the city as on a farm. The boy leaves the farm because he knows he does not know enough to farm successfully. The teacher knows he does not know enough to teach agriculture, and the farmer believes no one knows enough not even in the agricultural college. But believe me, skepticism leads on the temple of truth. I tell you in this case the way to move the log-jam is for the Institute force to take up this question of teaching the elements of agriculture in the common schools. Be patient, we are moving a great body."

Here is still another, A. C. True, Ph. D., who says: "So far as the present outlook is concerned, it is perhaps not too much to say that many believe that this movement (New York) directed toward the young people of the rural counties is the most important one which has developed in agriculture since the Experiment Station idea. The patrons of the schools and the farmers themselves should take an active part in this movement; impress upon the school men that real education needs a help to adjust the public schools to the advancing requirements of agriculture."

Chas Skinner, a very prominent educator says: "The necessity for instruction for our young people along the lines of agriculture and domestic economy is unquestioned. The difficulty at the present time is the lack of teachers themselves trained along the necessary



lines. The extracts of as many trades as possible must be introduced into our common schools."

When G. Stanley Hall speaks, all educators listen to what he says. He said: "One of the most important and pressing problems of our rural schools is the applying of the instruction of the school to the practical business of the farm through the employment of teachers in sympathy with farm life, and the enrichment of the school course by the introduction of agricultural subjects.

L. D. Harvey says: "There has been for some time a steady and growing demand that provision should be made for instruction in the principles of agriculture in the public schools. Not one in ten of them can read any proper book on the principles of agriculture or a farm journal intelligently. Of the science upon which successful practice in agricultural pursuits depend, they know nothing, absolutely nothing. And yet they are to enter upon their work with this preparation. I am one of those people who believe that the student who spends time anywhere in any grade of school in acquiring knowledge of value only for training when he might acquire other knowledge value for other purposes and equally valuable for training, is wasted time and energy. A five-dollar gold piece has a certain definite value, but the individual who would grasp a five-dollar gold piece when he had the option either of taking that or a ten-dollar gold piece, would be a fool."

Let me read you what Secretary Wilson has said on this subject: "Colleges were originally organized to educate preachers. We do educate doctors, lawyers and dentists now, but none of the schools furnish the education they need. We must not hope to educate agriculturists if the study of subjects relating to their profession is delayed until the beginning of a college course. In the primary schools the rudiments of agriculture must be taught."

Now just a glance at what is being done in other countries. We cannot do here in a country that has existed so short a time so much as some of the foreign countries. For instance one of the countries I shall speak about began agricultural experiments about the time that this state was admitted to the Union.

In Norway, Sweden, Denmark and Finland, L. D. Harvey says: These four countries have an agricultural school for about every 58,000

of the rural population, and an experiment station for every 220,000. In order to reach a similar ratio in Wisconsin, there would have to be 34 agricultural schools and nine experiment stations."

In France The Agronomic Institute of Paris, 1876, have 65 instructors, among them many of the highest scientific authorities of France. Its purpose is to qualify students for agriculturalists and proprietors of estates; secondly for teachers in the schools of agriculture and thirdly for administrators in charge of investigations; fourthly for directors of experiment stations and fifthly for directors of agricultural societies. In France they have national schools of Agriculture; three of general agriculture; three of veterinary science; one of each of horticulture, dairying and technical agriculture and societies and schools of general agriculture. They have instructors in second grade schools, and they have practical schools which are partly national and partly local, the government paying for all the teaching. In practical schools they have apprenticeships for the sons of the laboring class. The state pays for the teaching and for the boarding of the apprentices.

The elementary pupils from 7 to 9 have lessons in the garden. The middle primary from 9 to 10 years, object lessons and excursions to familiarize the pupils with soils, fertilizers tillage and corn implements. Higher primary pupils from 11 to 13 more methodical instruction, some harvesting, etc. Such primary pupils over 13 years, complete course in elementary agriculture. 3,400 of the rural primary schools have guaranteed teachers; 160 superior primary schools have more than 15,000 officials. In the normal schools they are required to prepare the teachers for the common schools by passing examinations in agriculture.

Why present this subject to the dairymen of this state? To influence your interest in bringing about this. What shall we do to make the education in the common schools so the young people shall desire to remain and expect to go on the farm, and secure for themselves an education which will be helpful to them. First, we can insist that our normal schools shall do all that they ought to do in respect to this matter.

Let me read from the law that brought into existence our first State Normal School: In the Act of the General Assembly establishing the first public normal school in this state occur these words: "The object of the Normal University shall be to qualify teachers for the com-

mon schools of this state by imparting instruction in the art of teaching and also branches of study which pertain to a common school education in the elements of the natural sciences, including agriculture, chemistry, vegetable fertility, etc." Such language is found in the Act establishing the Southern Illinois Normal University, and not a normal school in the state until last year has done anything along this line.

At the dedication of the Southern Normal University, John R. Tanner said at Charleston, in 1899,: "My suggestion is that greater emphasis be put upon the teaching of the elements of agriculture. Too long this has been neglected; ours is pre-eminently an agricultural and horticultural state, and the main wealth is our soil. It is in the interest of the state, as well as the individual that its fertility be maintained. To do this it must be manured with brains. Our young people who are to become owners of the soil must be so educated that they can read intelligently and appreciate the literature of the farm, including the reports from the experiment stations, as well as the scientific part of the best journals."

I think that this Association could have an influence in the right direction, by deciding that it shall be done in accordance with the law.

Another thing that would help indeed, would be the leadership of Harvey, who said: "I recommend that the present law relating to the qualifications of teachers be so amended as to require an examination in the elements of agriculture in addition to the other subjects upon which the examination is required for a third grade certificate."

And another thing that would help would be visits to this university. Under the leadership of Supt. Kern of Winnebago county, in the spring of 1902, 285 young people visited the Agricultural College of Champaign. Mr. Hunt and Mr. Thompson of McHenry county organized a party of 175 for the same purpose. Col. Mills went with 150 from Sangamon county. Then Christian county said she would beat them all, and did too, under the leadership of Mrs. Anna Louisa Barbre, with 350 people visited the College. I read the other day of a boy 16 years of age who was never on the cars before. Think of the revelations to come down her and see the work that is being done. They should be more of these excursions.

Another thing I wish to speak of is the work that Prof. Rankin is doing. He is here to come in touch with the young people of this state who are interested in farming, and if as you go to your homes you have a son that is looking around to do this kind of work, put him in communication with Prof. Rankin. Let Rankin send to him the blanks which he is sending out, that will lead the young man to a line and system of work and observation and reference to corn raising, and so get in touch with the University.

In the summer school, there were 200 students. This must help, and it would help a good deal more if those teachers that come here felt that they must pass an examination in the elements of agriculture before they could secure certificates; they would give better attention to that department.

One subject that I touch with hesitancy, is the subject of short courses here. I want to speak of it modestly. In what I say, I may not be in perfect harmony with what is being done here. I am very positive that a grand work is being done, and all of us know what was done here ten years ago and what is being done here now, deserves praise. I cannot help the feeling that the short courses would attract a good many here who would not come otherwise. They would go back and tell others what could be done here and influence others to come. If he commences at six weeks and tells his neighbors about it, and comes back and brings two neighbors with him, he is doing a good work. The professors here seem to be afraid of the term "short course."

They bring here in January several hundred young people to consider the subject of stock judging and corn judging; they will be here from the 19th of January for two weeks, and I am sure it will be very helpful. I wish there could be more of it.

Just let me give you a little of what is being done in other institutions, but not for comparison. After talking with Dean Davenport, I am inclined to think people do not understand the facts about this institution, and the reason is in the published matter that goes out—you don't tell the facts. The Dean told me a person could come here and study this or that and get practically what is short course. The teachers do not understand it that way.

I take Harris's report and I read that if you come to this college,

a man must have two things, geometry and algebra; he must have all the studies that go to make up a high school course, and when he gets here he will find a four years' course in agriculture, and I don't read that you find anything else. And I read that the other colleges have something else. That is misleading; they don't understand it. I have been a teacher for a good many years and I have talked with the Dean about it. I have a little slip here I would like to read: Secretary Wilson in the report for 1901 said: "There is an interesting demand for short and special courses and the colleges are meeting this to a larger extent than ever before."

Now, if I don't misunderstand the Dean, they can get that very thing here, but I had to come down here to find that out. I am going to talk to the Farmer's Institute at Carthage. Shall I tell them this? I don't believe you want it concealed. I wish to see it in printed matter. The next week I am to be in Rock Island. I would like to tell them this; would like to carry it as good news to the people of these counties that the young people can come and spend a few weeks. Sometimes circumstances prevent a longer period. Tell me to tell it to the farmers and I will tell it to everybody I can. Secretary Wilson says: "I am frank to say that I feel more sympathy with the view which you take of offering short courses to farmer boys. A little taste of such a thing is very helpful, and will be the means of leading on many a boy who otherwise, perhaps, would not come in." Wilson says maybe he is wrong; maybe I am wrong, but I am glad to be in such good company.

Let me tell you briefly what the short course is doing for Wisconsin. Prof Henry says: "At first I was not a believer in a short course of agriculture which was conceived by our Board of Regents; the Hon. Wm. F. Vilas being the father of the Act. It was my duty to obey others, and in a short time I saw a new light and have been a most hearty supporter and promoter of the effort from that time on. The short course has been the salvation of this institution and we have the hearty sympathy and support of a large number of farmers."

You see Prof. Henry objected and now the numbers are so large they can scarcely provide for them. When a boy comes once he comes again and a neighbor comes with him. They sent so many out into the state and made such a favorable sentiment that they passed a bill that

provided for country training schools for country school teachers; a training to some extent along agricultural lines—they have six of these. Two years later the sentiment was so strong, a bill was introduced and passed for the country agricultural schools and they have two of these. They have seven state normal schools; six country training schools for teachers; two country agricultural schools and a requirement that every teacher who teaches in Wisconsin shall pass an examination in agriculture science. Just how much of this is attributed to short courses I do not know, but a very large amount of it is. All that is necessary is a creation of public sentiment in favor of the short course.

In Michigan, the agricultural schools take boys from the rural schools completing the 8th grade. As a result of that some very very strong men have been sent out, men who would have been lost to agriculture had they gone through a high school course before going to an agricultural college. High schools often lead boys away from the agricultural schools rather than to them. This letter I have read was from Prof. Henry telling how averse he was at first to short courses, but you see the result.

But if I understand it, it is done right here today, only it does not appear in print. These 102 scholarships at the request of the Illinois State Farmer's Institute may be filled by boys who have completed 8th grade work, and, in some cases, who have not merely completed 8th, but have come here and may come here by and by when completed 5th grade work. If they can come here and do such work, let me tell it, and give me some printed matter that will help the boys to understand this and bring the boys in here.

We used to teach, or some people did, that a school must not specialize until through high school and college and then specialize. How many would be helped in schools of specialization if that was the rule? In the 2nd grade only 91 get to the 3rd grade; 78 to the 4th grade; 71 to the 5th grade; only 37 to the 7th grade; only 26 to the 8th grade, and only 12 to the high school, and only 1 in 30 goes to college. If you can't specialize until after you go through college, what will you do with the 99 who can't go to college? Circumstances will not permit some boys to go there, and he ought to have some chances to do his special work.

"We want elementary agriculture as a subject in the rural schools by all the schools not being allowed to make the next generation narrow and more specific, but to make them broader and more intelligent first in their vocations and then in all that pertains to good homes and good citizenship. We want to educate towards vocations."

A few years ago I heard a professor say in comparison that "The colleges of fifty years ago were narrow and specific and that the universities were broad and general." I was taught that the schools of fifty years ago were broad and specific.

We have three classes of education. The first class earns as little as it can and wants the very highest wages it can get. The third class always earns more than it receives, and it is of the third class that the successful men come. Third promotions are earned. We want to educate so as to increase the number in third class. Earn forty dollars a month and receive fifty dollars, and you become indebted to the world. Continue long enough, and you become bankrupt. Earn fifty dollars and receive forty, and you will be wanted in places of honor and trust.

In this matter of education, we should think of the happiness of the people to be educated. In order to educate it should be done so that he shall be on the road to truth, happiness and higher enjoyment—you must educate him for usefulness.

Cochran has talked of his happiness. He says you cannot get happiness through fame, because a man is not famous until he is dead. You cannot get happiness through wealth; if you think so, look about you and see if the wealthy people are all happiness. You cannot get it through knowledge, for no one can slake his thirst at that fountain. You cannot get it through power, for the moment you use the power for yourself you lose the power itself. Whence is the source of happiness? It is absorption in some form of labor. I would like to have the power to so educate our boys that they can become absorbed in some form of effectual labor. Ruskin says labor without thought cannot be happiness, and the two cannot be separated with impunity. Long hours and hard labor are not the curse of the world. We hear of this 8-hour plan. In the country we work eight hours in the forenoon and eight hours in the afternoon. My observation is successful men have adopted that plan. It is not long hours, it is joyless labor that is the curse of the world.

I have already talked too long and ought to have something pretty to give in conclusion. I have found an extract that you may have heard from a citizen of this town, the superintendent of the schools of this town—Carter, a man to whom you will have the pleasure of listening from time to time.

“Teach the children if you must the sowing of the dragon's teeth, but also teach them of the sowing of clover and cow pease, and how they can double the corn yield in Illinois and greatly increase the yield of cotton in Georgia. Tell them the story of the wooden horse if you wish, but be sure to give them more horse sense than Trojans had. Teach them all you know of the milky way, but do not neglect to teach them the way to milk. Soar with them as high as you may, but be sure all the time to let their feet rest on the earth for it is from the earth that all are sprung and upon it there are untold pleasures undiscovered, beauties and marvellous strength for the soul of mankind.

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#### REMARKS BY DEAN DAVENPORT.

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I could give Prof. Allen printed matter on this subject, but it is limited. The very thing he has asked permission to tell. I hope he will tell it everywhere. We want anybody to come here from anywhere and to take anything we teach, and we say that same thing in printed form, in our special college circular. We send thousands of them out and take pains to say this.

I have one thing more to say about the short course. We are only quibbling over the definition. We talk about subjects, neither long nor short course, that is the old college notion that a fellow had to enter a course of some kind. Our work is based on the new university idea that a man may come and study what he wants to, study without reference to a course. We offer 80 things in agriculture to students, and when we get more money there will be 180.



There are many many ways a man may graduate from this college. The institution offers subjects not courses. We don't offer courses either long or short. That is the old college plan. We don't talk about courses to students in the University; we talk about subjects. We teach 80 in agriculture, and a man may take 17 or 3 or all of them he cares to. The point is this, you can come here and take anything you want to any time when you are ready to take it. Whatever is taken and closed up, whether one subject or five or ten or fifteen, he is given credit for in the University toward a diploma. Let's not talk of courses of study, let's talk of subjects, and the more subjects he can study the better man he will be.

It is a question of subjects. The number of subjects and the careful way those subjects are taught is the point; we are quibbling over the definition.

We will live to see the day when such a thing as it being necessary to have certain grades for an entrance to a university will not be needed. We are going to see the day when the university will say to a man who comes to its doors: "What do you want?" and he will say such and such a study, and the university will answer, "Come and get it, and God bless you"; then he will not be asked to jump over a gate six feet high or pull himself through a hole two inches square; no bar between the man and the subject. That is our thought in all this. There is no course, except for the man himself and we suit him as well as we can. He can come for six weeks, or two or three years or four years. If he takes a four year course he gets a diploma.

By the President.—The work tomorrow morning is stock judging. We have the use of the stock judging room and Prof. Fraser will meet you all there at 8:30, or, rather from 8:15 to 10 in the judging of dairy cattle. There will be other professors there from outside states. This is a very important subject, so be sure and be there if you can. The regular session commences at 10 o'clock and the addresses will all be on that same line of thought, the different breeds of cattle. Tomorrow night the meeting will be held in Physics Lecture Room, where we will have stereopticon views, and I should like to have the room full.

*Wednesday Morning, January 7th, 1903*

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WHY THERE ARE NOT MORE CHEESE FACTORIES IN THE STATE  
OF ILLINOIS.

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By J. R. Biddulph, Providence, Ill.

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I think there are a great many reasons. The first I will mention is, the farmer does not know the value of a good cow. You ask why? Because he has never had the value demonstrated to him. Few men living on the farm really know the value of a good cow throughout the entire year. She will be just as good the next year if properly cared for.

To prove this, I will have to show you what some of my patrons have done this year. In the first place I will give you the number of cows each man has; how many calves he has raised, the amount of milk he has brought to the factory, his average test, and the number of pounds of cheese received; also the average price he has received for his cheese, and the average amount of money he has received for each cow.

After making the above statement this thought came to me, how can I give a fair statement? I found I was like the little boy. He was walking along and met his chum who was eating an apple. He said to him, "If you will give me a bite of your apple, I will show you my sore toe." His chum handed him the apple and as he did not expect to get another chance at it, he took a big bite, but he found that he had bitten off more than he could chew. I found I had done the same thing.

After looking over my books I found the number of cows for the entire season, from April 1st to December 1st, has not been the same. Some of my patrons found it convenient to bring milk for a very short time, and others would gradually increase, so that it makes it very difficult to tell exactly how many cows produced milk through the entire season. I will simply have to state this approximately.

As near as I can ascertain, I received milk from 230 cows. The number of pounds of milk received, 921,223. The average test, 3.53. The amount of cheese made, 91,243. The average amount of milk for a pound of cheese, 10.09. The average price for cheese clear of the making, 9 cents. The total amount of money received, \$8,601.76. The average amount per cow, \$33.05.

Now I will give you a statement of some of my patrons who brought milk for eight months.

NAME	No. Cows	Lbs. Milk	Avg. Test	Lbs. Cheese	Avg. Price	Money Recd.	Red. for Calves	Avg. per cow
J. Cahill .....	8	42,812	3.47	41.00	9c	\$364.00	\$32.00	\$50.12
S. R. Sears.....	7	27,098	3.80	29.10	9½c	315.94	35.00	50.13
D. Canty .....	3	16,227	3.52	15.86	9¼c	146.70	10.00	52.23
E. Cappins .....	14	60,287	3.47	58.18	10c	581.80	170.00	53.70
M. Tyne .....	8	34,949	3.55	34.36	9½c	309.24	35.00	43.03
C. N. Booth .....	5	21,228	3.20	19.56	9c	176.05	100.00	55.21

Now take the years from 1870 to 1880, there were a great many cheese factories erected in northern Illinois. Where are they today? They are turned into creameries or something else. What was the reason? Because they thought they could make skimmed milk cheese or filled cheese, and the people would take it down and say nothing. They were mistaken. They quit the cheese making and turned the factory into a creamery. I do not know of but one factory that tried the filled cheese making that went back to making full cream cheese, that was the Willow Spring factory. That is still running, and has no trouble to sell all the cheese it can make. You all know there is always a demand for a good article.

Another reason why some of the factories did not run. A few men would get together and talk up cheese factory, and then build one; they then thought they must employ a cheesemaker from the State of New York to make the cheese. That was where they made a mistake. A

man might be a competent cheesemaker in New York, but coming into this state he would find that it was necessary to learn over again, as the milk works differently in this state than it does in New York. So that in a great measure he was a failure, and the factory had to be turned into something else. I know of several instances of this kind; one in particular.

In 1873, there was a stock company formed in the town of Providence, Ill., to build a cheese factory. It was built and started to run the 18th day of August. They hired a man who had learned to make cheese in Illinois. He ran the factory the remainder of that year and the next two years. Then they hired a man from New York a short time after this. Before the factory started up in the spring, I was talking to one of the directors. He told me what this man was going to do. I listened until he had finished, then I said to him, "You will find out that that man does not understand his business." They did. I do not say that he did not know how to make cheese in the State from which he came, but he was a failure in this State. The factory went to ashes and the cheese with it. This is one reason why there are so few factories in this State today, for in a great many places they have had the same experience as the one I have just mentioned and they do not care to try it again.

A second reason why there are not more cheese factories in the State of Illinois: As I said before, they commenced to make a poor cheese, which caused the merchants to send to New York for their cheese, and they still keep it up. Why do they do it? Because they cannot get cheese that is made at home, or, I should say, in the State of Illinois. You can go into two-thirds of the towns in this State today and ask a merchant what kind of cheese he handles, and he will tell you, "I get my cheese from New York." What is the reason? I will say because there are not factories enough in this state to make one-tenth of the cheese there is consumed.

Well, some will say we can't get cheesemakers to make cheese that will suit the trade. I will answer that, by saying that a few years ago that was so, but today there is no excuse, for the State has erected a building here in Champaign, equipped it with machinery, and secured the services of Prof. Erf to instruct the young men how to make cheese. I

understand that he has not one scholar to teach how to make cheese when he ought to have many.

You can't induce young men to learn any business if they have to go to another state to find employment. They have to go to other states because there are not factories enough at home.

I will now mention another reason why we do not have more factories

I will now mention another reason why we do not have more factories in Illinois.

You propose starting a cheese factory in some rich farming districts in Illinois, and the reply comes, "We can't keep cows on our land. We can raise 50 to 60 bushels of corn per acre, but you must go where the land is poor to start your factory."

I think you made a mistake. Land that will raise so much corn will surely produce more grass than this soil, consequently produce more milk. Again, land that is cultivated year after year will soon run out, I do not care how rich it may have been to start with. On the other hand, if you go into the dairy business, make cheese or butter, they will soon have a piece of new land to plow and get as much off of 30 acres as has been reaped from 40, and with less work to keep the weeds down.

A third reason is, we can't get farm hands to work on a dairy farm. They do not like to milk. I will agree with you there to some extent. One reason is that they do not want to work in the field until sundown, as a great many men want them to do, and then have to milk from six to ten cows, take care of their horses, get their supper, and by that time it would be ten o'clock. Then they could go to bed to rest awhile, turn over, get up and go to milking the cows again. I do not blame them for not wanting to work on a dairy farm. Get them up at a reasonable time in the morning, so that all necessary work can be done and get in the field by 6:30 or 7 o'clock. They will do you a good day's work. Quit at 5 o'clock, put the teams in the barn, have supper and then milk. Then their work is done for the day, and they can spend an hour talking and get to bed at a reasonable hour. If this routine for the day is carried out, I do not think you will have any trouble to get hands to work on a dairy farm. I know this to be a fact, as I have seen it tried.

Again, turning to our subject, some will say, we are afraid we will overstock the market, and there will not be a demand for cheese. Well,

that same story was told thirty years ago and still cheese is worth more today than it was then, and a greater demand for it.

As I said before, I have made over 90,000 pounds of cheese this season and there are four other factories within a radius of seventeen miles that have made equally as much. I think there has not been one cheese sent to the Chicago market.

I have heard a number of traveling men say that whenever Illinois cheese, or Wisconsin cheese has been introduced, they can't sell the New York cheese.

A great more might be said on this subject, but I will not weary you longer.

#### DISCUSSION.

Mr. Gurler.—Did I understand you that those figures were for the entire season or for eight months.

A.—Eight months.

Q.—How did they raise those calves to estimate them at such a price?

A.—Some sold them when they were two or three days old.

Q.—I understand you in that paper that there was a difference in milk. For instance, a cheesemaker coming here from New York, used to making cheese in New York, and this milk worked differently, and he did not get as good results?

A.—No sir, he can't.

Q.—He can't?

A.—There is more gas in milk in this state than there is in the milk of that state, and the water is different.

Mr. Newman.—I noticed in the first part of your paper, you give per cow earning about \$30.00.

A.—\$33.00.

Q.—These figures you gave us were the best patrons?

A.—No, not the best; I just took a few of them.

Q.—Didn't they all average over \$50.00 a cow?

A.—One \$43.00.

Q.—If it is \$50.00 a cow for eight months there ought to be more cheese factories?

Prof. Fraser.—There ought to be more cheese factories from the fact that it is entirely impossible to find more than three or four factories. They can get good cheese in Canada. And other towns are in the same condition. Why can't Illinois get cheese in her own State. It seems to me we should consume more cheese than we do from an economical standpoint and from the taste of it. But we don't seem to realize the food value of cheese.

Mr. Biddulph.—Mr. Gurler was asking about those calves. He raised his calves on sweet whey.

Mr. Gurler.—He must have fed those calves something more than sweet whey?

A.—When old enough gave them grain.

Q.—Probably started them on milk for awhile.

A.—For a few days, a short time, calves can be raised on sweet whey. I have tried it. Bought a calf three days old and it never had anything after that three days but sweet whey until September.

Q.—What was the value of that sweet whey in comparison with skim milk?

A.—I never figured it out; have been told you take the sweet whey from the whey vat. You have got to do that or it is no good.

By the President.—The next on the program this morning is Mr. M. S. Campbell, of Genoa, Illinois, who will tell us about the Holstein breed of cattle.

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## REPRESENTING THE HOLSTEIN BREED OF CATTLE.

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Address by M. S. Campbell, Genoa, Ill.

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Mr. President, Ladies and Gentlemen:

When asked by the Association to represent the Holstein cattle at this meeting, I felt that a better speaker should have been chosen to represent the good qualities of this grand breed of cattle.

Again when I read the program and saw I was first, I thought he was wise, as he well knew it would take Mr. Taylor but ten minutes to tell about Brown Bess, and Mr. Stewart to tell about his Ayrshires and the others, consequently a good share of the time this morning I can tell about the Holsteins.

It would take a good man weeks to tell about the good qualities of the Holstein cattle. I will only try to tell a few of the things. I guess the Guernseys must have died on the road, as they are not represented here.

We used to know nothing about butter fat. The milk was taken to the factory regardless of quality, and we will acknowledge openly and publicly that the Holstein-Friesians do not give as high a per cent of butter fat as the Channel Island breeds; but 3.6 per cent has been made some eight years ago. Consequently they will make more butter than any other breed of cattle. They have demonstrated this in all the public tests all over the world, in the United States and Canada. They take nearly all the butter premiums except at the Pan American and World's Fair, because they were not represented there as they would have been if there had been any breed test. At Omaha they went in there and took everything—first, second and third prizes. So they have at all the state fairs and expositions, and at the Pan American you know they got second prize. They got first prize on products.

By the way, I will just give you the net earnings at the Pan American. First in the list was Holsteins; they had a net profit of \$274.37. Second in the list was Ayrshires with \$242.30. There was the second best breed of cattle in the United States for dairy purposes. I will say right here—and I ought not to say it—if it wasn't for the short teats on the Ayrshire cows they would be a pretty close first with the Holsteins if they had the same teats the Holsteins had. Short Horns came third with \$220.85. The Guernseys were down about eighth with \$207.65. They had there the cream of the Guernsey breed and were down eighth. The Holsteins went out in one or two herds and took five cows which made almost \$65.00 better than the cream of the Guernsey herd. They did get more butter. The Holstein-Friesians made the greatest gain in live weight among the dairy breeds and were excelled only by the Short Horns. That shows conclusively to every one what the Holsteins could do at the Pan American with



only five ordinary cows. I believe myself I could go right out in the State of Illinois and pick out five better cows than they had. If they can come next to the Short Horns for beef, why are they not termed a dual purpose cow as well as a very ordinary cow? A Holstein will feed out piecemeal as well as any other cow.

The Michigan Agricultural College a few years ago took two each of Guernseys, Holstein-Friesans, Jerseys and Herefords and kept an accurate record of them for seven months and on food consumed, and the two Holsteins had the greatest gain. They required seven pounds and a fraction of mixed food to increase a pound in weight. The Herefords required ten pounds of the same mixed food. The Holsteins were the most economical feeders in the test. That is just the same as they are doing out here. They are at it every day and weighing the food. If those Holsteins made a gain on seven pounds and the Short Horns had to have ten pounds, why are they not a superior animal?

I have heard you can take six or eight pieces of meat, put them on a plate, and you can pick out the Holstein meat. I just heard that, but don't take it seriously. The only reason the Holsteins are not good for beef, is they are too valuable an animal to feed to beef. There is no better animal than the Holstein for taking on flesh during her resting period. There is not another class of cattle that can do it better, and it is a question in my mind if there is a better.

They claim that Holstein butter is of an inferior quality. Possibly that may be so, but it is pretty hard to tell. At least the most expert judges cannot tell when taken into a room where the butter is not labelled and they cannot tell. The chances are if they guess at it they will give it to the Holsteins. Mr. Jackson judged the butter at Madison and the test was so close that the judges decided to leave it to expert butter judges. Jackson was one of the judges and he is a Guernsey and Jersey man, and had both those breeds on his farm. They supposed he would give the Guernsey and Jersey butter the preference. When he got through he had given first, second and third to Holsteins and hadn't given the Guernseys and Jerseys a place, for the simple reason he could not tell the difference. One of the men asked him if he could tell the difference between Holsteins and Channel Islands and he said "Yes," and tried to

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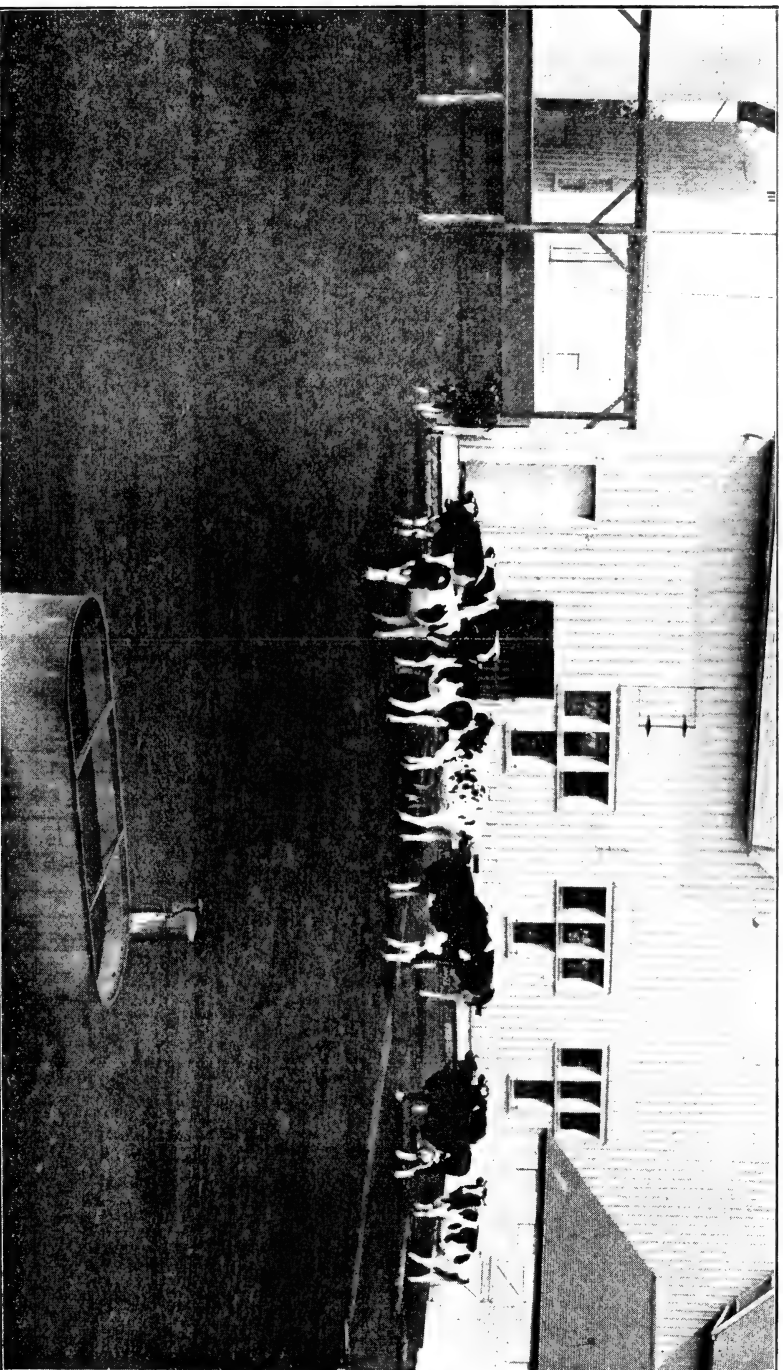
explain it, but he was ignorant of the fact that he had given the prizes to the Holsteins.

Everybody acknowledged that the Holsteins at the Pan American were an inferior lot. If you were there in September when the Holstein Association went out there at their own expense and brought in cattle there for a week and showed the public what they had, you would have seen a different grade of cattle. The cows went in and made upwards of 2122 pounds, after being shipped on the cars. I don't believe the fair way is to take a cow away from her home.

In 1891 the Holstein-Friesian Association offered to put up \$500 in the First National Bank of Syracuse and asked any other breed, dairy breed, to put up a like amount for butter test. Just made a bet you might say on the Holsteins. In a few days the Jersey men accepted the offer, but when the Cattle Club met they said "No, they didn't want to cover it." Why wouldn't they cover it? Offered to take it any way even pounds in the fat and the World's Fair standard, 80 per cent fat (85.7 now), but no one would cover it. That offer stood good for a year. It seems to me if they cannot come up and meet us in open competition on fair lines, it must surely be a fact they cannot compete with the Holsteins.

The place I know of a butter test being made was in the State of Washington. I happened to know the cow that won the prize, Peek-a-Boo, raised near Syracuse, N. Y. She was a very good cow. Test was for one day, 24 hours. In the evening at 6 o'clock the representative saw the cow milked dry. At 6 a. m. Peek-a-Boo gave twenty pounds of milk which tested 3 per cent on the butter fat, 84 valued at 25 cents; total value 43.05. And in the evening gave 30 pounds, test 3 per cent and 9-10 pounds butter fat, valued 22.05; total for day 43 cents. Total pounds of milk 58, value of milk a day 52.20 cents.

The Jersey men claim that she don't make butter, but she gives us the stuff to make the butter. Here is a list (shows paper). All official records under the Experimental Station, for the Holstein Association. Each cow is milked and the milk weighed and tested and sampled. The owner has nothing more to do with it than you sitting there, after he draws the milk. The representative takes the pail from under the cow. He keeps these samples in his own possession. No man has access to them whatever. If that thing is continued as it is being done, why we



BARNYARD IN EXCELLENT CONDITION. GROUND WAS FIRST GRADED THEN COVERED WITH CINDERS.

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OF THE  
UNIVERSITY OF ILLINOIS

are going to bring our cattle up until it is pretty close to 4 per cent, cows with a yearly average of 12,000 pounds of milk. Here is our year's work. Look at the list of cows when in print. That of itself is evidence that they are butter producing cows.

We had a cow last year that made 290.5 pounds of butter with an average per cent of fat of 4.02. That is no bad Holstein cow and she is no freak either. These records are made every year.

It seems to me that in all fairness to both sides of the question that the Holstein ought to be placed among the best dairy breeds or dual purpose breeds that there is. The Short Horn claims they are dual purpose, any they are a good cow, but I prefer a strictly dairy type cow for me.

About the feed used in testing, that varies a great deal. Some men feed very heavy, while other feed moderately. About the best results have been gained with 18 pounds to 20 pounds grain ration a day. I think Mr. Gillette uses about that now and Mr. Jones, of Watertown—and all the roughage they will consume.

Another thing about the Holsteins we want to claim is about her beef qualities.

What the quarters weigh. Dressed out front quarters are 218 and 211; hind quarters 236 and 234. You take front quarter meat, it sells for about 3 or 4 cents a pound less. That's an item worth looking at. We have killed both Short Horns and Holsteins and I can't see but what they are just as good a meat as any of them, if fed right. As far as the size and form is concerned, there are no larger cattle. It is nothing uncommon for the cow to weigh 1600 to 1800 pounds and the sire 2500 to 3000 pounds. That thing alone, if you have a large animal is better than a small one because it costs the same to raise. It costs no more to raise Holsteins than any other good eater.

I will not talk too much to you, but wish to convince you of the good qualities of the Holstein cattle.

By the President.—We must give the other gentlemen a chance.

#### DISCUSSION.

Mr. Gurler.—In that test in which you claim the milk from the Holstein cows took the prize, was that milk handled by the same party, or did the same party make the butter?

A.—At the Pan American?

Q.—At the place you claimed they took the prize?

A.—At Washington the milk was all handled by the same man; the same representative saw all the cows milked himself.

Q.—The same party made the butter?

A.—It is done by the Babcock test, per cent of fat and amount of fat.

Q.—How would he judge that that was the best butter?

A.—At Madison, why he gave all the prizes to the Holsteins.

Q.—Did the same party make the butter from all those different breeds of cows?

A.—I could not say whether the milk was handled by the same man or the three or four men that were working in the factory; all done in the Madison Square Gardens, the same as in Chicago.

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#### REPRESENTING JERSEY BREED OF CATTLE.

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Mr. H. C. Taylor, of Oxfordville, Wisconsin.

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Mr. Chairman, Ladies and Gentlemen:

There was a time in the history of the world when the Bible and the newspapers were reliable sources of information and truth and everything read in their pages were believed by the readers. I am led to believe that hereafter the world will have to look upon the Dairymen's report from Illinois to find some truth relative to the breed of dairy cattle. This will be evident to you when I get through talking.

The Illinois Dairymen's Association in session assembled. I feel like asking the question in the language of the good old book, "Were there not ten converted, but where are the nine?" I am sorry there are not more of you here, but you are here and we will give you a good talking

to—the best we can. Give it to you for all we are worth, and quit promptly on time. I ought to explain this before I start, in. We were out in the circuit a good many years with our cattle and made many splendid acquaintances, but when we led our cattle through the gate into the ring friendship ceased right there—we were there to win.

I am not here today to shut off my friendship for the dairymen. Not a bit. I want to say that the men that represent the dairy breeds of cattle and dairying in this United States are the grandest set of men in the business anywhere. The dairymen of Wisconsin, Illinois and of the United States of America are the best citizens, the best neighbors, the kindest husbands and the best men in public affairs, and I would not for all the world hurt any one's feelings who is in the dairy business.

I want to say a few things in regard to the Jersey Breeders' Association first. We have 230,000 registered cattle in America; many of them have died and gone to heaven. We have registered this last year 10,250 and we have transferred 8,250. The year before we registered about 263 imported cows. This last year it was less than 100. We have this difference in quarantine, which will be registered as soon as they get out. The business is about the same as a year ago.

We have this last year a new kind of butter test, containing 1,369 different cows that have made a record of 314 pounds or over. Not in the last year—it dates back from July 16th last to August 6, 1898. With this last report 7,000 cows have made a record of 314 pounds and over. This last year 350 cows were reported as making over that amount, and 45 of them by the Babcock test—the rest by the churn. These were owned by 100 different men and are owned in 24 different states, including Canada and the Southern States.

I shall not at any length of time talk to you today to prove to you as farmers that there are herds of dairy cattle in one section that have done such and such a thing. I am referring to dairy cattle that have made records in my state or your state, or Michigan, Georgia and every section of the country and from which reports have come. We have them from

the extreme points of the United States, showing that close to 350 pounds of butter can be produced from pure or grade Jersey cows. That may be surprising to you when you think that in this state it is something less than 200 per cow, and Wisconsin 220 per cow. There are individual herds backed up by good dairy judgment and skill, with good selection of my breed of cattle that made 350 pounds of butter per year, and I believe, and you believe it, and the question is up to you to act upon it, whether you will do the same. Unless you are interested in dairying all this will pass for nothing. If you are interested you will look the figures up that go to make up the sum of \$90.00 per cow at the market price of dairy products. It is then up to you to know how much it costs to keep that cow a year. By selling some of your feeds and purchasing others you can get the actual profits in the dairy business, but I will talk to you more fully along this line this afternoon.

I wish in this discussion that we might cement ourselves in one solid body to march forward; that we may have on our banner a picture of every dairy cow of every breed, and that we could go forward and get what we are after from the people who represent us in the legislature.

I have the greatest respect for the man who is working with the Holsteins, the Guernseys and the others, and they are the best for him to have and to work with, if he is prejudiced in favor of that breed of cattle. There is plenty of money in the dairy business and there is no use at all for us to work against each other's interests and say that we alone have the only true dairy cattle.

I may not be quite consistent with that, but yet I shall speak what I believe to be the truth before I get through, and I am only going to talk ten minutes.

We go to the legislature and ask for an appropriation for our line of dairy work. What did we get? We were told to go away by ourselves and get together on some issue and then come together and they would consider us. It is like the church that wanted prayer for rain. They were told by their minister when they had agreed on the hour he would pray for rain, and he never had any chance to pray for rain.



Up in Wisconsin they were making filled cheese. Got those little centrifugal separators and some cotton seed oil and one thing and another and beated it and called it cream cheese. There was not a bit of butter fat in it. We got together and we went to the legislature and spoke to all our representatives and we told them we want filled cheese declared illegal—and we meant it. We got that legislature to pass a law to make it illegal in Wisconsin. If you want to make skim milk cheese you got to make it 9-inches round and 9 inches high every time and then when you see it on the market you know it is skim milk cheese—and they don't put any on the market. The filled cheese people are up against it, and what do you think we had to do? Make a better cheese. They sent men to Canada and stood them around there to see what they were doing that they could make better cheese. We got \$2,000 from the legislature and spent \$1,600 in investigations. Sent some men to New York and took soundings and such. Wisconsin has as good water as New York. Why can't we do as well as New York? And it is the same with you fellows in Illinois. You can do the same, if you go at it right. We educate these young men in the schools of New York and Canada and brought them back, and they went into the factories and took in the milk at the weigh scales in the morning and took a little sample of every man's milk, and when the evening came these samples were all made and saw how good they were. That is the Wisconsin curd test.

We made that cheese all the way through and then invited the patrons and gave them a good talking to so they would give us good milk to make good cheese. We spent \$1,600 to get that, but we made 65,000,000 pounds of cheese that year and it brought a cent more that year than New York cheese and the same price as the Canadian cheese brought. So our experiment paid. That's what they do. The Holstein men were in with this hand in hand and the Guernsey men and we went in on the grand march and won. An English company bought the cheese all along that line of road and put it in a good big vessel and sold it in London, and it is so uniform you would think that it was all made at one factory. Sold it all in London.

The legislature said we must have the co-operation of other legislatures and we said we would have the co-operation of the men in congress. You had one man in Illinois who wanted to join in with us. You can't do that thing—it isn't fair. You may sell Illinois cheese for Illinois cheese and Wisconsin cheese for Wisconsin cheese, and that is right. You have got to have united sentiment behind it all. There is a whole lot in this business. Excepting the church and family relations, it is the best family to get into. You make acquaintances all over the country.

I have to speak again this afternoon, but will speak of it twice. We as Holstein breeders and Jersey breeders and Guernseys have lost sight entirely of one end of our business. Never been in sight and it is the best end. It is the breeders' end of the business. I think I have license to talk a little about that. We as dairymen lose sight of the breeders end of the business. We have not got pure bred cattle.

I want to take you as you are, working with grade cattle of some kind or native cattle. You ought to so breed and bring up your herd to such a standard, remembering all the time that you will have surplus stock to sell in the course of events. What are you going to do with them? You are losing sight of the fact that there is a market for your dairy stock. I want to make that point here. In every dairy herd the breeding subject should be thought out to a finish, so that you will have surplus stock to sell to the dairymen, not to the butcher—the poorest market in the world for a cow. Everyone has said that is where she is going, and, of course, that's the final end of all of them. We are more fortunate ourselves—we have a place 2x6.

There is going to be a Short Horn man talk after me, so will stop. But must say it takes no more feed to raise two heifers than to put one beef steer on the market, and I challenge a contradiction of that. A little more coarse feed maybe and you can raise two dairy cows of two and a half or three years of age as cheaply as you can raise one beef steer and make a good one of it, and the heifers ought to be good ones, too, and will bring in more money than one steer will.

There is a market for good dairy cows all the time, and right now, too; just think of this.

For fear I would get up a stump for something to say, I wrote one page on the typewriter, and here it is:

The Jersey cow is appreciated by the dairymen in all dairy districts. She is sought for by men wanting dairy workers. She is going into the dairies for what profit she can make her owner. This is just what the dairy breeders want her to do. This is her mission—this is her place. And when appreciated and cared for she is a source of delight and profit. She is owned by the breeders of the Short Horns and Hereford cattle to furnish milk and cream and butter to the families who demand the best of everything. She is found in the herd of Holstein dairies just for the looks of the thing and to keep up the standard of quality required by the law. She is an ideal city cow, furnishing a regular supply of rich milk nearly the year around. She is a splendid cow for business. It can be said the Jersey cow has set the standard of excellence for all dairy products. Down on your streets I read the sign, "Jersey Creamery Butter." The milk dealer hurrying about the city has his wagon placarded with "Jersey milk and cream." On wagons drawn by a fine team with bright new harness has this sign painted on it. "Pasteurized Jersey Milk and Cream." Did you ever see the name of any other breed of cattle on a milk wagon?

It is also true that the Jersey cow has fixed the type and form by which all dairy cows are judged. The high type, pure bred Jersey cow is the accepted highest dairy type. All great producing cows of whatever breed have the form of the Jersey.

Mr. Chairman, I thank you.

By the President.—

We shall have the pleasure of listening this afternoon to Mr. Taylor on the selection and care of the dairy herd. I would like to send a special invitation to our hog friends to come and hear him. It is something they need to know. No dairy farm is complete without a good breed of pigs running with them. He is one of the first dairymen in the country and knows what he is talking about.

The next breed will be the Brown Swiss. Mr. Barton is unable to be with us, so has sent Mr. James to take his place.

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### REPRESENTING THE BROWN SWISS BREED OF CATTLE.

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Mr. E. M. Barton, Hinsdale, Ill., by Mr. James.

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Mr. Chairman, Ladies and Gentlemen.—

I very much regret that you will miss the pleasure of listening to Mr. Barton who was delegated to take this subject, and you will miss one of the bright spirits we meet on our journey through life. He could have entertained you if he could have been with you, but it was impossible for him to attend, so he wrote out a little paper for me and delegated me to come down here and represent him today, and I will do the best I can in reading his thoughts.

The Brown Swiss breed of dairy cattle is not represented in this country by large numbers. The cattle have not generally been grouped in large herds nor have they generally had exceptional care or advertising, but they have been sufficiently numerous and well thought of so that they have grown in numbers and reputation and the average quality is well maintained. This is due to the inherent qualities of the breed, the race being an ancient one and probably one of the oldest existing breeds of dairy cattle. Its characteristics have been reproduced for many generations and are pretty generally understood among observant dairymen. I shall not, therefore, occupy myself in this paper with extended statements or arguments with respect to the general characteristics and excellence of the breed.

The Brown Swiss are known to be good all round dairy and beef cattle, well suited for the production of milk and of meat. Their milk is of good quality, averaging 4 per cent fat, just suited for table use, for infant feeding and in fact, for all purposes. The cattle are hardy, they are not of nervous

or discontented disposition. They thrive on ordinary care and respond well to extra care. They are uniform in their characteristics; their calves are very rapid growers. All this is generally known.

What I wish to dwell upon in this paper is the advantage of using the Brown Swiss as a breed for crossing with native cows and with grades of other breeds. To answer this purpose the characteristics of the breed should be obviously and permanently reproduced in the first and second crosses, otherwise the results would be too remote to be of the highest practical value.

Are these characteristics so produced in the half bloods and three-quarter bloods as well as in the higher grades? This is a question which can not be answered by statistics. We shall have to depend on individual testimony and observation for the answer, but I can point to numerous neighborhoods and sections of the country where highly satisfactory results of this sort have been obtained. It is, of course, easy in passing through a dairy country, to look at the herds in the pasture and tell what kind of a bull is being used, a Holstein bull or a Jersey bull when used with common cows will mark the herd as grades of the one or the other breeds, but it is always perfectly obvious that the cattle in question are grades and not pure breeds. The point that I make is that the uses of Swiss bulls under such circumstances will produce, even in the first and second generations, a large proportion of calves that will require close observation to determine whether they are grades or full bloods, and this in spite of the fact that the characteristics of the Swiss breed are very pronounced. The results in color and shape and special points of peculiarity occur in spite of great diversities in the cows that are started with. Not only are points of shape and color reproduced and the tendency to quiet attention to business and to convert food first into milk and then into meat is found in the first grades. In other words, the Swiss breed is a very prepotent one.

We have tried in our own herd some experiments in the way of crossing one pure blood with another, for instance, breeding pure Jersey or Holstein cows to Swiss bulls. The results have been highly interesting in many

ways. In all cases the first cross shows the Swiss blood very strongly. Generally the first cross, where the cow's nose is red, brings a black nose in the calf. The calf grows rapidly and fats easily. The milking qualities are improved in the heifers. The young stock can do well without extra care, and at the same time they respond to extra care when it is given them. Where there is a familiarity with Brown Swiss grades the cows and heifers and young cows readily bring a price from 50 to 100 per cent higher than the grades of other sorts.

Without entering into the question as to whether the Swiss breed is superior in all things and in all respects to other breeds, I am willing to go so far as to express the belief that its characteristics and general excellence are such that for dairy purposes Swiss blood would improve any dairy herd even of pure bred stock, and it will very rapidly and promptly improve any herd that is not pure bred.

I recognize that under existing conditions no owner of a herd of pure bred cattle of any breed could cross his stock with any other breed and make the result profitable. For the cross bred animals would not sell on their pedigrees for as much as the pure breeds that he started with. There are obvious reasons why this is so. If, however, the breeding of cattle were subsidized by the government as the breeding of horses is in France, or if there were some way for breeding experiments to be carried on systematically and with intelligent plan for results and wait for the public recognition, I believe the most hopeful results could be reached by judicious crossing of recognized breeds and among such crosses the most valuable for dairy results would be crosses of Brown Swiss with the other dairy breeds. The results would be an average gain in dairy quality at least and at the worst no loss in dairy quality, and at the same time a decided gain in constitution in hardness, in longevity, in the by-product, veal, and in the value of cows when they cease from age or other causes, to be profitable milkers. My idea is that the Swiss breed would for such a project occupy a place analogous to that of the Arab horse in horse breeding. The breeds of horses that are useful are many of them made still more useful by an infusion of Arab blood, or on a larger scale other useful breeds are improved by Arabian. The dif-

ference between horses and dairy cattle is that it takes no more than about five minutes to tell how good a particular horse is for a particular purpose, whereas it takes the entire life of a dairy cow to tell her worth. For this reason experiments on an extended scale with dairy animals are expensive. Breeders must creep along feeling their way in the dark. Phenomenal qualities on the maternal side, which are difficult to reproduce among dairy cows than among other animals. Dairymen, therefore, who work for profit, have to limit their experiments and work for results they can see and form a judgment of without waiting too long.

The great bulk of the dairy products of the country come from cows that are only ordinary in quality. Some of them are not capable of returning a profit; a few return a fairly good profit, while the far greater proportion are just about on the line, paying just a little profit. These are the herds that need grading up and improving by degrees. It is here that Brown Swiss bulls may be used with great advantage. The principles of breeding which have been followed in Switzerland for countless generations have produced a race of cattle which is specialized in the matter of constitution. The Swiss breeders have not sought for phenomenons. They have gone on the principle that a good cow bred to a good bull will produce a good calf. They consider that no valuable quality in a cow can be neglected. They depend upon the same cattle for their milk and meat. The result of many centuries of breeding on these principles is as might be supposed. The characteristic of general excellence, the result of careful and intelligent breeding, has been supplemented by bringing up the young stock upon the sides of the mountains with good food that has to be worked for, good water and air. The cows and bulls are in demand for export to almost all countries, for they do well in all climates. Not only do they thrive in our country, but in all parts of it, and their blood is particularly valuable for mixing with other blood because the other blood gains as much as possible in every way and is sure to lose nothing, there being no valuable characteristic of dairy cows lost or diminished when Swiss blood is added.

## REPRESENTING SHORT HORN BREED OF CATTLE.

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Mr. Fred L. Hatch, of Spring Grove, Illinois.

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Mr. Chairman, Ladies and Gentlemen:—

When I was chosen to speak of this subject I was alarmed. The idea of speaking of Short Horns to people at a Dairymen's Association Convention, when every other breed would be represented by dairymen, I hardly knew what to think of it. I expected no other quality would be talked about but the dairy qualities, but after hearing these gentlemen speak I see all that our Jersey friend has represented was the general purpose cow. I learn that Jersey cattle are only just models; a little thing that is made to carry around. I want to ask you how many men that supply milk to the factories in the State of Illinois or Wisconsin have any quantity of the Jersey breeds in their herds. Who can afford to have it; how many have retained it? I would not debate for a moment that the qualities of the Jerseys are for specialty, some particular trade in milk and nothing else. They are grand, good little cattle. I owned them as much as 25 or 30 years ago and have some to this day, but they never gave the milk that the Short Horns did.

They always out-tested the Short Horns. I had them test as high as 6 per cent; did our own testing; this is no average. We tested with the Babcock test. The Short Horns tested 4 per cent, and as much again in milk. They are just models. I have never looked for a little heifer but what I thought there was a model for the Short Horns. The little diminutive thing—I could put on this stand. You would not want to breed her on your farms; you could not afford to. It is grand that we have this breed to show what the best of the breed can produce, but the great working people of this state and other states have been men that have to do something else but make milk alone. They sell cattle.



I should not have thought of pursuing this talk but from what these other men have said. Talk about ancient history! The origin of the Short Horn cattle is lost in obscurity, yet it has the oldest and most authentic history of any of the improved breeds.

We have in the Princess Tribe a clear line back to the dam of Trifes bred by Mr. Stephenson of Kelton, England, in 1739, and suggestive evidence beyond that. She was but a fair sample of the local herds at that date.

By facts obtained from history we are forced to the conviction that really this cosmopolitan breed which adapts itself to every climate and condition so readily in successful amalgamation with the cattle of any country it may invade, is but a relic of the herds of the Benedictine monks who migrated to England in early times, being a gradually grown up conglomerate of the beast from all breeds with which the pioneers of cultivation in every guise became acquainted during the course of accumulated centuries.

In ancient times the cow was kept for her work and milk, and the production of beef did not fully enter in the calculations of the agriculturalist.

That impulse came with the increased demand for animal food among the manufacturing population so when England became the leading manufacturing nation on the globe she also lead all other nations in the production of beef cattle.

We shall scarcely be in danger of contradiction then when we say that the Short Horn was the first brought into notice in England by its compound character, its usefulness for any purpose rather than its supreme usefulness for one purpose.

Not alone its early maturity; not alone its extraordinary power of improving other breeds, not alone its sometimes enormous yields directly of milk or indirectly of butter, but it is the rare combination of these and other properties, such as easy adaptability to change of climate, small consumption of food in proportion to product and a constitution strong and hardy that gained for the Short Horn its wide distribution over the British Islands and subsequently commended it to the favorable notice of our stock breeders.

No breed is more elastic in its adaptation to the objects of its breeder and the circumstances of its life. The type then which first came into prominence was a milk-and-beef animal in which the balance between dairy and beef was more or less even.

Such a type was highly artificial and therefore the tendency was to revert to one or the other of the simple types. To produce a dairy cow at the cost of weight and rapid growth of flesh or to produce a beef animal at the cost of the loss of milk. Such cattle were bred by the pioneers of Short Horn history—Bates, Collings, Mason and others.

Such cattle were first imported to this country; cows with great udders, broad backs, prominent hips, tapering necks and rather inclined to be long faced.

This type of cattle were imported to the middle and eastern states from 1796 to 1830, and for many years were kept quite true to the original type. Such Short Horns can still be found, as is attested by the many good cows shown in the various dairy contests, and when such cows are found there are none better and as our average farmer is not a specialist, and as the great body of farmers must raise cattle as well as produce milk, the Short Horns will always occupy the premier place on our broad prairie lands.

The Short Horn has had many rivals. The Herefords and Polled Angus as beef makers, and the Holsteins and Jerseys as milkers—and many were all one purpose breeds and have had other breeds in both classes, but they have to await their time for accumulated wealth in the hands of the specialist to handle them.

Now that this is the present position of the Short Horn numbered by thousands scattered from Maine to Oregon and from British America to Florida, between six and seven thousand of them thrown upon the public markets at auction annually at prices still at the top, with new and promising rivals in the hands of moneyed individuals and corporations what will the future be?

There are three classes of breeders wanting cattle. Those who look to beef alone; those who look to milk alone, and those who want both.

The Short Horn has strong rivals in appealing to the first two classes, but is unsurpassed in claims in favor of the third. This third class outnumbers both the others. The average good farmer in the west wants cattle both for milk and beef. He cannot afford to keep a cow a year simply to raise a calf, he cannot afford to disregard size and form for beef making.

The best specimens of the breed are unsurpassed as beef animals. Naturally the breed has good dairy qualities. It always has been in the past and still is the chief dairy breed of England in practice and at the dairy shows taking more prizes than all other breeds combined.

The general farmers aim is to possess a cow that at her best will fill the pail, and when dried off will rapidly pad her ribs with meat; and for this purpose no breed has been found that affords the requisite better than the Short Horn, which is the result, as we have told you, of many hundred years of thoughtful amalgamation of the best by the pioneers of agriculture so far back as the 12th century.

A cow that will milk abundantly and fatten heavily at the same time; that will be broad over the crops (behind the shoulders) and loaded with rounds in full yield of milk, butter and cheese, yet dances will-o-the-wisp like in the distance, is it not most probable that the cow to first appear in that distance is to be the Short Horn cow of the future?

I have gone over this subject very thoroughly, and have pages and pages that I could read you. The Short Horn cattle as have been demonstrated can be so well adapted to so many circumstances that they are more nearly to the farmer's liking. They are handier to manage and there is less fear of their going astray. There is not a farmer that breeds Jerseys and Holsteins this day that could not say he would doubt very much whether his cattle could take the usage the Short Horn can. I am not advocating this rough usage, but I am stating that such usage that the farmers' cows of Illinois and Wisconsin are getting and are likely to get for some time to come.

## REPRESENTING THE AYRSHIRE BREED OF CATTLE.

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Mr. John Stewart, of Elburn, Ill.

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Ladies and Gentlemen.—

I didn't suppose that we came her to condemn breeds of cattle, as I believe that all breeds of cattle at the present time introduced into the United States have their good point. I was rather astonished to hear those men make statements extolling their cattle beyond all others, and condemning some other breeds.

I cannot give you a speech, but can tell you something of what I know about Ayrshire cattle. Thirty years ago I went across the Atlantic and brought a lot of cattle from Scotland. Since then I have kept from 25 to 100 head of pure Ayrshires. I have imported along at times and kept up my herd. I don't want to claim to you that all Ayrshire cattle are good. There are poor cattle in every breed; that will crop out, just like it does in children. I don't keep mine for money-making.

The difficulty, my friends, is, in my judgment, the American people are all for money. They will stand here before you and tell you how much they have made and how much their cows have paid them. They don't tell you that the majority of men that have gone across the Atlantic and bought cows, including Holsteins, Jerseys and the others, have bought them for about \$100 and sold them for \$500—and we are making money. That is something I know nothing about personally, only as I read.

The Ayrshire cattle I have kept and have a record here which I will briefly outline to you later. They are good milking cows. They are tolerably easy to keep, not large, but healthy, thrifty cattle.

They have been kept for some 300 years or over in Scotland and raised for the purpose of milk. In going through England, Scotland and Ireland if you notice a certain kind of cattle Jersey I will say. You take the Jersey

cattle; they are close by England both the Jersey, Guernseys and Alderneys, close to the coast of France. But you will notice in one place all Jerseys. Why are they not all over England or Scotland. They are called the rich man's cows. They do give a lot of milk. I will not disparage any cattle, but I want to say this about the end of cattle. The gentleman who sits over there stated to you that you should not send them all to the butcher, but that you could raise two heifers as well as you could raise one steer. That is correct. But he knew; very well, but he didn't tell you, that you cannot raise two heifers and have two good cows. A majority of them don't become good cows; they go to beef. If he can do that I never could. I say that you can't raise all the heifers and have good cows.

You talk about the dual purpose cow. It is a foolish thing; there is no such thing as an all-purpose cow: it is perfectly ridiculous. Take the calves from Ayrshire cows and let them suck the cows and get plenty of milk to look well and show well, but the majority of them never make good milkers. They turn it into beef the first year.

You go to a farm in England and probably find Durhams; they are good milkers; their stables are kept strictly clean and all one kind as a rule. Go to another farm and find another breed and each one thinks his is the best. But it is folly for a man to stand and tell you that a herd of Jersey cattle is the proper herd to keep to sell milk in Chicago or to manufacture butter. I have had large experience with five farms and 250 head of cows and I know that up in Kane county and McHenry county when they go into dairying they would laugh at you if asked to buy Jersey cows to make milk to sell in Chicago. They are nice to make butter and for a man to keep. Therefore, I think the idea of Jerseys for everybody is entirely out of place.

I have here a few statistics. I have not kept a regular list of what the cows have done.

1880-1901. Ayrshire herd owned by C. M. Winslow & Son of Brandon, Vt. This is the milk record for 1901.

The herd was established in 1873 by a bull and six heifers, and an occasional purchase since of a noted cow or well bred heifer with a view of im-

proving the herd. The bulls used have been the best that could be found, from cows of noted dairy quality and long tests. The best heifer calves from the best cows have been only kept to take the place of the old cows or such as could not reach the herd standard. The milk is weighed at each milking from each cow.

Until 1899 the butter has been computed by the addition of one-fifth but the method has been changed to one-sixth to conform to the standard adopted by the experiment station. The per cent of butter fat and total solids is the average tests made by the experiment station.

Cows from this herd have won first and second prizes for the butter fat prize offered by the Ayrshire Breeders Association and State Fair jointly for the years 1896, 1897 and 1899. This herd is free from tuberculosis.

In the summer this herd is driven about one and one-fourth miles to pasture, with a small night pasture near the barn. They are milked in the stable and are fed from a half to two pounds of spring wheat bran at each milking. During the fall they have the run of the meadow. In winter they are fed all the low meadow hay they will eat clean and from one to four pounds of bran, the fresh cows having two pounds of mixed feed in addition. This mixture is ground barley, cotton seed meal, linseed oil meal, Chicago gluten meal; equal parts of water. The grain is fed once a day. The cows are turned out to drink at a tub of running water twice each day, and on pleasant days they remain out an hour or two in the middle of the day.

In breeding and selecting cows for this herd careful attention has been paid to the dairy ability of each cow, and unless a cow in her prime could give 6,000 of milk or 300 of butter she was posted off regardless of other good qualities, and a cow standing in the stable was not secure unless she could give in her prime, under favorable conditions, 7,000 of milk or 350 of butter in a year.

This herd was made as uniform in size, color and style as possible, that they may present a fine appearance either when standing in the stable or moving along the road to pasture.

The following is the general make up required:

Size—About 1,000 at maturity. This size having been found to give the best results in this locality, and being of sufficient size to please buyers either for breeding or to sell in Brighton as milk cows

Color—Dark red with clear white patch—about one-third to one-fourth white being preferred. This gives a wonderful attractive appearance to a herd of cows, grouped or moving. Then, too, I have noted cows of this color were tougher and gave yellower milk and butter.

Style—Small head and horns, slim neck, straight back, sharp shoulders, wide on the loins, large shapely hind quarters, long, slim tail, udder extending well forward and back, well up under belly, teats long of equal length, well spread, large milk veins.

Disposition—Quiet and pleasant.

The following is the best 365 consecutive days' milk record of cows that have been in this herd and are ancestors of the present herd:

Name	No.	Milk
Rosa .....	3143.....	7562
Muriel .....	8650 (15 yr old)	5662
Alleta .....	10259.....	6445
Acorn .....	4492.....	8031
Acme 5th .....	10342.....	8183
Rose Layde .....	11158.....	8194
Bonnie Nannie 4th	11701.....	8507
Roxie .....	4498.....	9191
Rose Electa ....	10336.....	10207
Rena Myrtle ...	9530.....	12172

The following is the best record of butter of cows that have been in this herd and are ancestors of the present herd:

Name.	No.	Lbs of butter
Rose .....	3143.14 lbs., 16 oz. 7 ds	
Muriel .....	8650. (15 yrs old)	259
Alleta .....	10259.....	325
Acorn .....	4492.....	308
Acme 5th .....	10342.....	386
Rose Ladye .....	11158.....	463
Bonnie Nannie 4..	11701.....	381
Rozie ..	4498.....	316
Rose Electa ....	10336.....	467
Rena Myrtle ....	9530.....	547
Rena Deross ....	10347.....	572

The following is the milk record for 1901:

Name.	Age.	Milk.	Test	Butter.	Total Solids.
Rose Deruth.....	11	6641	3.42	265	11.50
Rose Deross.....	11	6219	4.06	295	13.26
Rose Cleon.....	10	5556	3.90	253	121.69
Rose Clenna.....	9	7874	4.21	388	13.115
Crinkle Douglas 2nd.....	8	5755	4.08	274	13.22
Rose Veritas.....	8	7066	3.97	327	13.011
Acelista .....	7	9330	3.76	409	12.46
Iola Lorne .....	7	7448	3.75	326	12.79
Rose Erica .....	7	9361	3.37	368	12.16
Linda Douglas .....	6	7618	3.80	337	12.81
Rose Carentine .....	5	7069	3.95	326	13.04
Rose Aster .....	3	5037	3.97	233	13.211
Rose Ellice .....	3	5464	3.89	248	13.05
Rose Radnor .....	3	4542	3.91	207	12.95
Alfreda Corslet.....	3	5693	3.68	244	13.00

For less than a year:

Name.	Age.	Milk.	Test	Butter	Total Solids
Rose Capricie .....	3	5395	4.07	256	13.26
Rose Rano .....	3	857	4.25	42	13.08
Rose Dolman .....	3	5065	3.67	217	12.69
Rose Weymouth .....	3	4422	3.84	198	13.09
Elsie Corslet .....	2	4409	3.62	186	12.88
Floy Corslet .....	2	4130	4.30	207	13.95
Rose Dapple .....	2	607	3.50	25	12.36

Average milk for the year 6711.

Average butter for the year 300.

Average percent butter fat 3.85.

Average percent total solids, 12.82.

I have here a twenty-two year milk record that I will give you:

In 1886 10 cows average...	6035 lbs milk	1891 14.....	5971
1881 11.....	6176	1892 12.....	6249
1882 9.....	6672	1893 10.....	6233
1883 15.....	6168	1894 19.....	6454
1884 16.....	6814	1895 17.....	6765
1885 11.....	7025	1896 16.....	7289
1886 16.....	6238	1897 15.....	7228
1887 16.....	5782	1898 19.....	6956
1888 16.....	6356	1899 17.....	6180
1889 15.....	5836	1900 22.....	7189
1890 17.....	5480	1901 15.....	6711

Average for 22 years 6446 lbs.



Of course, I have never sold my Ayrshire cows—never made any money out of it. If we were in the business for the purpose of making a few people rich, I am not. I thought we were here to improve our stock—not to sell cows. You can raise and sell them if you wish, but I don't make a practice of it. I keep them for my own use and sell the milk, therefore, I don't make any money.

My brother tells a little story on me. He says John Stewart makes money in the lumber business and spends it farming. I am sorry to own up but I guess it is so.

There are only a few Ayrshire cows in the state of Illinois, and they belong to Judge Blodgett, Mr. Jones and myself. There may be a few scattering ones, but they are a disgrace to the breed.

It is nonsense to extol breeds of cattle. There are good cattle in all breeds. In crossing breeds I must say I am opposed to that. Crossing cattle is like crossing breeds of people—you get some good ones and some bad ones. I have got good milk cows and have crossed them but they don't last. They change around and you get too many bad ones.

You ask a Scotchman how he raises his calves and he will tell you he gives them a little new milk and then gives them skim milk and wheat if we have it and develop them with a large stomach and thin in the neck and slim in the head and wide behind, and feed them on lot of coarse food so that they will develop good. We don't raise our calves on our cows. You will spoil the cows if you give them all the milk they will drink when young.

#### DISCUSSION.

Q.—Are Ayrshire cows good milk cows; have you proved that in your own case?

A.—Yes, sir.

Q.—You go to Chicago with your milk?

A.—Yes, sir.

Q.—Shouldn't you push Ayrshire cows in Illinois and get them to use them?

A.—Perhaps that is true. I don't keep anything but Ayrshires—pure Ayrshires on the other farms, too.

Q.—But you won't persuade others to have Ayrshires?

A.—The Ayrshire cow is a good cow, but I don't believe in pressing cows.

Q.—Do you feed your own cows all season?

A.—I never feed my cows meal in summer—I think they live longer. I don't feed them up and then get rid of them.

Q.—Do you use silage?

A.—We dare not use silage where I live. We sell milk to the condensing factories and in Chicago and they won't allow us to use silage. We can't do that. I would like too and think it good feed. It is as good feed as can be found if he takes care of and feeds it right, but the average man up there won't take milk where silage has been fed up there.

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By the President.—

I would like to meet these five gentlemen either now or this afternoon at 4 o'clock. Would it be convenient Mr. Hatch, to meet right away?

A.—Yes, sir.

By the President.—

Very well, we will meet now.

The last dairy report is at the door and any one of the members or friends are welcome to take one as they go out.

Tonight Prof. Fraser will talk to us in the Physics Lecture room.

The butter room will be open tomorrow forenoon and you will find that by going down the hall into the east wing of this building. The creamery room is around the same way only in the north wing.

The dairy barn is on the south end. Please be there at 4.

The stock judging room is on the east of the building and some judging will be done by Prof. Haecker tomorrow morning at 8:15.

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ADDRESS.

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By Chas. Y. Knight, Secretary of the National Dairy Union.

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Mr. President, Ladies and Gentlemen:

I was not expecting to be called upon quite so quickly. I told our president I wanted a little time to collect my thoughts. I have been devoting my time lately to collecting money and expect to go on tonight. I generally want to know whose here, before I know what I am going to say. There are times, as I know by experience, when the people in the audience and those on the platform have different views, and it is often necessary for us to "cut the cloth accordingly."

I feel pretty safe though here today, when I look around and see the old body guard here. I see our friend, Mr. Stewart, one of the old war horses of the legislature of the State, who has probably done more for this institution at Urbana than any other member of the legislature. And there is Mr. Long—Long in name and long in stature—such people as they and Mr. Newman here make me feel in good company and I can say anything.

We hear it said and it is very true, that so long as an army is fighting for a victory or fighting on the defensive, it holds together, but when peace is in sight, that then is the time that you get dissensions in the ranks. When in front and facing the enemy, the forces on the defensive or on the aggressive side must keep together, and after the fight is over they get into wrangles.

The greatest work the dairymen of Illinois have done in legislative matters is to prevent wrangles in our own ranks. It is an old trick of the enemy to stir up strife within the ranks of an army or wranglings.

The greatest difficulty we have had in keeping on our fight against oleomargarine, has been to prevent dissensions taking hold in our own ranks. We must present a united front in this matter to do any good at

all. If we have any dirty linen to wash, it must not be washed in public. We must not get into wrangles among ourselves, until we are surely out of the woods as against our common enemy. I say this because there is a tendency on the part of some of our friends, or supposed friends, to sow the seed of discord in an assiduous way in the rank and file, who are not thoroughly acquainted with the methods of legislature.

The first step toward diversity in our rank, is to cast suspicion on the people in the lead, and to raise new issues and attempt to take on too much. For instance, we had recently in some of our leading organizations, resolutions presented and ideas brought up which all tend to split the ranks of the dairymen in two parts.

In this matter I want to be very plain; I want to talk frankly to you, for the time is coming, or, rather, has come, to be frank and bring up this matter in a way that it has not been brought up before.

The product of butter in the United States is divided into two classes, creamery and dairy butter. The output last year amounted to about 1,470,000,000 pounds. Of that about 470,000,000 pounds was creamery butter and about 1,000,000,000, or ten hundred million pounds was dairy butter, of the 4,500,000 farmers interested in the production of butter. The disposition today among our people is to discriminate entirely in favor of creamery butter.

We believe, and I believe and have done all I could in the direction of having everything sold for what it is, and that is the way it is believed in the legislature, and we have done it to a certain extent and it is all right. I am in thorough accord with you that renovated butter, or worked over butter, or process butter, or whatever you want to call it, should be sold for just what it is. I would have no one defrauded in thinking they are getting fancy butter, when they are getting worked over butter. We might go to the extent of making every manufacturer of process butter to put their worked over butter in original packages, so that the public might know just exactly what it is getting, just the same as when they are getting oleomargarine. But, there has been a tendency here of late to prosecute what is known as renovated butter or process butter; there has been a disposition on the part of some people who ought to know better to say when we are fighting our natural enemy, that we must turn aside and take on more trouble. There have been resolutions introduced,

which means the bringing against us an enemy with three times the strength the oleomargarine people have. This antagonism that is being pushed today against renovated butter is causing us a whole lot of extra trouble. The manufacturerers of renovated butter stand in relation to the people who protect country butter, exactly the same as the creamery men do to their patrons. The man who makes renovated butter buys his material from the store keeper, and the store keeper from the farmer. Thus farmers, who furnish the material for the seventy-five or eighty million pounds of renovated butter that has been made in the last year, are working against their own interests when they offer these resolutions against renovated butter at this time. These manufacturers were just as active for the legislation that we have on our statute books as the creamery patron or the creamery man himself. In the districts of Ohio, Illinois and district of Indiana and other districts where there are fewer creamery patrons, it is the farmer who produces the stuff from which renovated butter is made that bought his manufacture.

These same manufacturers were in favor of the bill which required that butter to be marked; they thought it was right and that it should be known. Every one was satisfied to have this product marked so that people can know it; there has been no fault found. But recently resolutions have been introduced calling upon congress, or particularly legislatures to subject renovated butter to the same restrictions as oleomargarine is restricted, to prevent the coloring of it, etc. Such resolutions as that, and such work as that, means that we are bringing into the field to fight, another interest; an interest with suporters in ten places where the oleomargarine people have suporters in one. The moment you commence such a fight as this, you have forty or fifty manufacturers of renovated butter sending literature to the farmers who made the goods and they in turn flood congress with letters against the passage of any bill that has anything in it regarding the products in which is used their butter.

The oleomargarine law as it stands today is not perfect. We got it through the best we could. We have got to have it amended. The very minute we go into congress and introduce a bill in the house, the oleomargarine contingent is going to put an amendment on that and strike at renovated butter. They are going to put an amendment on that

calling for the passage of a tax on renovated butter. They are going to call up this resolution in the various conventions and cite that as authority for the claim that the dairymen favor this legislature. That minute that is put on that bill every renovated butter man is going to work against that bill, for the bill must be voted on and must stand and fall with its amendment.

For instance, we have a bill before the house, a vote comes up, the oleomargarine people are all in favor of an amendment putting this restriction on renovated butter. Enough have been brought in line who favor the same thing, the amendment is put on. Then on the other hand, here comes your renovated butter contingent with their resolution and petitions from the farmers who are producing that butter and whose butter is to be depreciated in this business and object to such legislation and demanding that no bill with such provisions shall be passed. The farmers who are friends of the renovated people vote against the passage of that bill, the oleomargarine people will vote against it and they together take away our support and we have not enough left to pass our bill, and we are in that way putting ourselves in position where we will have two enemies to fight if we persist in doing what has been started along this line. I can't see why the dairymen and the buttermakers and every one in connection with this business should not be satisfied to have this product renovated butter sold for what it is. I don't see why they should want to stigmatize it or characterize it or want to put on restrictions making it burdensome and keep people from handling it. It comes in the market and is sold today. The people who are making it are farmers, all keep cows and they work with us.

I simply say this because it is the thing today that is looming up. If it keeps growing, the tendency on the part of the dairymen or the creamery men and buttermakers to go out of their way and pick a fight with another interest, it is going to kill the whole movement and put us where we cannot do another thing, because we will have two men to fight instead of one.

What I say today, I say at the risk of being quoted as defending renovated butter. I am doing no such thing. I am coming here to warn you against drawing us into a fight with another interest. I remember very well when I was a boy that a friend of mine who was a pugilistic

fellow was always picking his quarrels with bigger boys than himself, and would then say, "I will get my big brother to fight you all right." Sometimes he would pick his quarrels with bigger boys than his brother, and his brother would get the worst of it. And I am saying that is what we are going to do.

The position of the dairymen today is this: We have got a law started on the statute books which prevented the oleo people from making as much the past year by 33 per cent. The product would have increased this year 33 per cent but for this law, with the high prices of butter; that is conceded by the oleomargarine people themselves. But for the progress that we have made with the oleomargarine law they would have increased it 33 per cent and would have made 66 per cent more than they have made this year. Prices during the last year on butter was 4.2 cents higher than the year before. The butter market has been higher than at any time for the past ten years; never has there been a time when butter has sold as well as it has the last year. But with the loophole that is left and was of necessity left in the law last winter, which permits the oleomargarine people to use various vegetable oils from which they may get a natural color, we see a danger that must be stopped next winter.

As it is today, oleomargarine is being produced with light yellow color. However, the color is gotten at the expense of quality every time. The natural ingredients are cotton seed oil, neutral lard, the best of oleo oil and that composition makes a white product. There is a crude cotton seed oil which can be used under the internal revenue order which gives it a yellow color, but there is a taste and smell which is in it that the best manufacturers of the finest goods refuse to use it and are making a pure white product. The yellow goods deteriorates in quality very fast. Those goods can be used in places like Chicago, but they are not good and not satisfactory for jobbers.

We found this about oleomargarine: the people who take uncolored oleomargarine at 12 to 15 cents is a channel and class of consumers that interferes very little with butter. It goes down in a strata and reach people who would not have anything on their bread but for this class of stuff. People can discriminate between uncolored oleomargarine and butter and can take their choice.

Two years ago in the City of Chicago, from the month of October, when butter went to 22 or 23 cents, it was a common thing for the retailers to take oleomargarine and never be seen on South Water street until the next July. They simply put colored oleomargarine in as butter. You could not detect it from butter by the taste, smell or looks. They had no scruples whatever in selling it for butter, and we never have been able to get a law in Illinois that we could reach those fellows. They had too much political influence.

We have got the thing in pretty good shape now as far as the matter stands today. I don't believe there is a great deal of fraud in the sale of oleomargarine. The people who want oleomargarine are getting it, and those who want butter are getting butter.

There is one thing we have got to remember and that is to keep the butter up to a June shade. In winter it looks like oleomargarine. If we don't our laws will be ignored and the oleomargarine people will be saying their goods is uncolored butter.

There will be nothing done in congress this session on the oleomargarine question. The session will adjourn on the 4th of March, and there will be no chance to amend the bill this year, but next December we will go before them. By that time, with the year and a half experience we will know what to do in the way of amendment. Until that time we have got to be well organized, keep up our organizations, got to watch every influence that is coming into our ranks and, as I said before, we have got to guard against any attempt to divide our front in putting the renovated people over with the oleomargarine people and have them fighting us when they were with us last year.

All that is necessary in the senate, is the influence of three or four United States Senators. We only had two majority in the senate last year, and there was renovated butter influence enough in the states of Nebraska and Kansas to have taken that away from us. We could never have done a thing without their support. With the new territory coming in, Oklahoma, which will be oleomargarine, we are going to have a pretty close shave.

That is about all I have to say. I am willing to answer any questions or give any further information you wish or any explanation necessary regarding our attitude in this matter.



Mr. Long.—Have you any figures relating to the output for oleomargarine for the month of December?

A.—I have not; it is too early in the month.

A Member.—I am glad to know what the word “artificial oil” meant

A.—It reminds me a good deal of the gentleman out went in a restaurant. A waiter came in and says, “Tea or coffee.” The man said “I will take tea.” The waiter replied, “Take coffee; we have no tea.”

I will explain. When we counted noses, we had about two majority in the senate that we could count on. When our bill came up in the senate their plan was to recommit it to the agricultural committee, the plea being that it was not thorough enough. So we counted noses, and when we got to Ohio, the attitude of the two senators was unknown. Thanks to the letters and telegrams Hanna received, he was very soon converted. He read the hand-writing on the wall. With Senator Foraker it was a different proposition. He said it had been represented to him that you can't make oleomargarine with yellow in it, and that we claim that the natural color of butter was yellow. We took the raw materials and tried to demonstrate to him how it could be made without same shade of yellow, but it was so light it would almost come under the 10c tax. A piece of white oleomargarine looks pretty white against white paint, but when against snow it has a decided tint of yellow he said, and said he couldn't vote for any Bill that stuck at the industry that way. But he said he was willing to go the length of preventing any manifest intent of defrauding. His vote had it. If he had voted against us, it would have been a tie and we would have been lost. We knew exactly how we stood and did the best we could, but it looked for awhile like an absolute throwing up of the fight. We had to accept that amendment. He was working on a speech against the Bill, but when we accepted that amendment, he came over.

We think with time we can educate some of those other senators that will stop that loophole in some way. I don't know how we are going to do it, but it has to be done. But we could not have made the Bill as it is but for that amendment.

I was rather unprepared to come up here and talk, but am glad to have been able to talk to you.

SELECTION AND CARE OF THE DAIRY HERD.

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By H. C. Taylor, Orfordville, Wis.

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Ladies and Gentlemen:—

If you have ever taught school you will notice that some people take the thought into their brains through the eye. I want you to look at this picture this afternoon. (Shows picture.) You will take in the thought through your eyes and consider.

We are going to talk to you from the standpoint of the dairyman and from no other standpoint. There is plenty of room in the broad, fertile farms of Illinois for the production of beef, and we will all admit that there is plenty of room here and there in Illinois for the dairy cow, and her products.

Just think a moment of the numberless things in use in this State, and every state, and all over the world, where people gather about their tables three times a day and render thanks to God for what they receive. Take a horn handle, a knife, and also ask to have the cream passed and the milk passed and the butter passed and the cheese passed. All of these are dairy products used three times a day, and we have one, two, three, four or five of these upon our tables every day in the year. It is a mighty industry.

It comes pretty close to the financial interest of every one of us that are maintaining a family and the responsibility of many upon the prairies of Illinois, and everywhere else.

I have listened today to some splendid reasons why there are not cheese factories in Illinois, and I know the gentleman spoke the truth in every syllable he uttered. I wish I could take you this afternoon just as you are, under the conditions you are laboring and trying to make some money from your farm by turing the energy of that farm and your time and your thought and the energy of time and labor of the members of

your family along the many lines that you might have your conditions better, and that you might be more satisfied and content, and really get more out of life and out of dairying than you do.

That is my object in coming here today, with one other object that I had in view and lies very close to my sentiment and heart. I would like to utter a remark that will be remembered for the bovine mother by the dairymen all over the world, that is of the care and treatment of this splendid mother. I want you to think hard for it is by evolution that we better our conditions and pocketbooks and all the matters pertaining to the material well-being of this world.

I have two pictures here. One is a dairy cow, and the other is not; you can see that at a glance; you know it; you take it in; you remember it. If you want to know how a dairy cow looks, look at this one. Close your eyes and see if you can see it there, how a dairy cow should look.

I feel serious this afternoon. I want to say to you that you as dairymen have but just one thing that you are entitled to in this great dairy business. Just one thing and that is a well bred and well born dairy cow with dairy tendencies. That is all you can hold a cow responsible for. There are 387 things that that dairy cow is entitled to and calls upon you for. But I will only mention 367 of them this afternoon.

In the first place, isn't she entitled, if she is well bred and born dairy cow, to a home with a dairyman. I submit it to you. She will be just as unhappy in a home that is not the home of a dairyman as some of us will be in heaven when we get there.

Supposing I have three cows like this (pointing to the beef animal) in a dairy barn and study the feeds and feed a dairy ration and then go to milking, then I will say, "What's the matter" and the cow says, "I am to blame; I am not a dairy cow; take me to my friends, they can appreciate my ability and tendency, and I will be happy and you will be better off." But you take this cow (pointing to picture of dairy cow,) put her in the barn of a beef man, and he goes out there and says, "Why don't you get fat?" She will reply, "I am in the dairy business; my mother was in the dairy business and my grandmother was in the dairy business; let me go home, I will there be happy and you better off." Isn't she entitled to go home;—I submit it to you,—with a dairyman?

I hardly know what to say first, and I don't know what the last thing will be. My subject is the selection and care of the dairy cow. You have so many pictures before you this afternoon that I do not want to take too much of your time.

You must, in order to get good dairy cows, select cows that look like dairy cows. You want to get acquainted with your cows, and that may take two, three or four years and maybe more. You know our wives don't get acquainted with us for fifteen years. Sometimes we find we have been foolish in feeding our cows.

I want you to select your dairy cows just where charity begins, right in your own home, in your own herd. Get the scales and the Babcock test. By giving the cow all she is entitled to. She is not to blame for one single thing; neither for her color or her breeding or tendency, her appetite of any of those things. They are all in your hands.

Now then, you must take this cow out of your own herd. You must, with the Babcock test and scales, weigh and test it and see how much profit she is giving you for a week so you may know at the end of the week how much profit you are getting. Go through your whole herd the same way.

Don't for any reason that you may conjure up, discharge her with her first calf. Bring her into the very best possible physical condition and feed her a good balanced ration and let her prove her ability, and then if she is not a good cow you can get rid of her. I would go through the whole herd this way. It will take some time to do it, and get rid of the unprofitable cows. One unprofitable cow is a tremendous thing in a herd of dairy cattle. If you have two cows, and one is making ten cents a day and the other loses ten cents a day on the labor and food consumed, how much are you going to make in a year, yes in forty years? You have got to get a third cow before you make any money, and that third cow must be a good one.

I want you to think of these things. You fathers have no business to let your wife provide for the help of a dairyman and ask your boys to get up early in the morning and care for the cows and stay up at night to milk, unless you can show to those sons and daughters that there is some money coming in as a profit. There was once an old presiding elder who visited a house and after the love feast he said, among other

things, "Christian brethren the time has come in the history of the church when we should have something very definite in our christian experience that when we go into the world that men may know whereof we have learned."

Isn't that true of dairying in Illinois, that we should have something very positive in our experience that we can show to our sons and daughters? What are we going to leave those boys? If you haven't something positive for them, they will go away, but if there is money in it they will stay at home. They will take hold of the farm if there is money in it and make it pay and show the old man he was cranky and wouldn't listen to anything new. They will make that farm blossom and be all right.

Every cow on the farm should make a profit the year through. Get enthusiastic, that will help you in your work. That is what I am trying to do this afternoon. You got to have it, and you must have it in a dairy business the year through or you will never win.

Select one cow, or two or three and put them in your barn and then what more you want, get from your own barn. Your neighbors won't sell them to you. They would probably be like the old German who put a price of \$50.00 on one of his cows, and when the man wanted to buy it, told him if she was worth fifty to him she was worth fifty to this German, and wouldn't sell it.

Now then, friends, be sure and put at the head of your dairy herd, a sire of some of the dairy breeds; get any dairy breed that you feel you like best. If you like Holsteins best or Guernseys or Jerseys, get either one that you like best and breed on that line. After awhile get another one of the same breed, and then a better one if you can, and continue, and don't let every little cold air that comes along change your mind. Be fixed in your purpose; go straight forward and have confidence in yourself to master the situation and you will win as a dairyman.

If you want to start pure bred cattle don't buy one breed of sire and after a while see something else that strikes your fancy and get that mixed in them. Why fool your time away in raising half grades and mongrels? If you have a cow, have a pure bred cow and the same with pigs and chickens, and you will find that you will enjoy pure bred things. And keep up with the times and hold up your head and have confidence in yourself for there is money in any kind of live stock. We have an es-

tablishment in our town that's raising pure bred black skunks and making money. One night an old skunk led them over the fence and they all went over. I was awfully sorry for the fellow, but there's money in pure bred stock.

In the old country, we find the pure breeds of stock. What would we have done, if they had not done it? They were so positive that they were right. They bred that old red cow that when her heifer calf came they made it a little better than they made her mother. The short horns and the long horns made theirs as well as they could, and the short horns were the best.

We Americans don't know anything about this business. I was going to say this when I started in. It will take lots of time to get into the dairy business. You can get out of the dairy business without learning a whole lot of it. It will take time to manage your fields to produce abundant dairy foods, and you don't want to manage any other kind of crop of your dairy farm.

I believe in specialties. If you go into lumber business, stick to it; if in the dairy business, do that only and do your work well. We have been the biggest fools in the world trying to learn what we can't do well, when we ought to have been following out one line of thought and doing better every year. A progressive school teacher always leaves his school improved every Friday night. It takes time to build barns and to know which silo you ought to build, but you ought to build anyhow. I built a silo and made it six feet in diameter and filled it with good silage, and expect it will be there when I am gone for the cows that are left on the farm. It has never been empty and I hope it never will be.

As I said before, it will take time to get all of these things together, and when you do, you are just ready to begin dairying. Yes, just ready to begin when you get your barn full of cows, and a car load of bran, gluten meal, and nice alfalfa hay and a whole lot of silage, and then it takes a whole lot of grit to feed it out. You can't get into it and out of it inside of ten years.

You see I am coming right back to you and hit hard. How much difference is there between beef men and dairymen? Just as much difference as between heaven and earth; just as wide apart as the east is from the west. A man that owns forty cows forty years and has made

no money out of it, can't lay it to the cows. It is the man's method of operation; he must be born again. Get an agricultural education, and show him how to farm. He should surely move to town and let his son run the farm, if he is too old to learn. And after you have got those cows and resolved you will feed them a balanced ration, you will breed them so the coming calves will be better than their mother, and it will take a good many years to acquire the knowledge that is necessary in this up-to-date time of dairying to manage that part of the dairy in every detail.

I want you to understand this, that a dairy farm, the unit of which is one acre of land and make it produce all it will produce with the right kind of dairy foods, and the dairy itself must be the unit of competition, and it can come to that standard which you must fix. And the other thing, we must be breeders to some extent of dairy cattle. Let us have a whole lot of young heifers, just fresh,  $2\frac{1}{2}$  to 3 years, to sell off of the farm. They will sell just as readily as a man sells eight to ten steers to the farm, and you can do it just as well as not, and you don't have to sell the best ones either; keep them for your own use.

I want to talk to you a little bit more; I want to get close to you. Let us consider in this northern latitude, about such a day as this, what is required at our hands as a keeper of a dairy mother that has just brought forth her young and expect to make something of her during her milking period in a year. Every cow before she freshens should be put in a hospital stall and that is a big proposition. It should be a box stall in your barn that opens into the barn and not outdoors. Every dairyman ought to have, two at least, of them. If that cow is to freshen I should have her in that box stall hospital, summer or winter, a little time before she freshens. If the grass is abundant in the middle of June and she is a good milker and you put her out she will fill up. But put her in that stall and turn her out nights, only part of the time, and take off her ration a little. If in July and August and the pasture is short and the sun is hot and she is an old cow, don't let her grub around all day to get enough to satisfy her appetite. Supplement her feed with a little grain ration and let her lie down and take her rest. If a young cow she needs looking after. Summer or winter let these cows have a hospital stall two or three days before they freshen.

When you go to the barn in the morning and open the door and there is a little calf, do you know what she thinks of when she sees you? She thinks of an element of danger, and she thinks the same things you would when danger presents itself to you. You want to run, and she thinks the same thing and she speaks to that calf and gets on the other side from you and wants to get out. You slam the door and go to the house and say to the boys, "Don't go to the barn, she is cross and wants to be let alone." You ought to go and close the door without saying a word, and go to the house and get a pail of water with the chill off and go back and open the door and step in and say, "Here is a pail of water, and she will drink it. She will drink it for she is famishing for a drink of water. She will look up and look you right in the face and be as grateful, and will show her gratitude when she freshens again. She will speak to her calf, and it will mean this: You are a nice little calf and you will come in front of the cow. Between you and the cow, that is what happens. You leave this calf and this mother by themselves together in the same place and you go away, and come back again in four hours and give her another drink of water and she will thank you again. Increase this drink as she is famishing for a little water and a little feed, just a little feed to take in the stomach to help her, and she will be all right.

Then for two or three days the calf is allowed to run with its mother. Let it have its mother's milk at first and it will start it out and it will grow on that mother's milk. You remember this: This cow has a fever. Don't turn her out such a day as this. What business have you to turn this mother on such a day as this? Keep her in the barn. Let her keep away from cold drafts, as all that great big, large udder will be affected is the slightest congestion or cold sets in.

Two, three or four days later you are going to teach her how to milk. She is nervous. Putting her calf over in a corner is a pretty good thing. She will be in the same room with it, yet not with her. Work on the confidence of that cow and go over in the other corner and she will eat and let you come where the calf is, and if she won't, she has no confidence in you. Let her come back and carress the calf and you can milk her then. She will think you are the calf. Then take this cow away to the barn and put her in her old place in the stanchion, or in the stall and in a few days again she will be alright. If you have the means of providing



this cow with a box stall, put her in that. Probably for the first hour she will look all around for that calf, but if you have treated her well and gently, she will forget it and never say another word about that calf.

Now then, my friends, you want to use your best judgment in feeding that cow. Nature is ready to respond to good care and treatment, and she will give milk to the last. If you feed her liberally she will respond most wonderfully and will give you more butter at the end of two months, if the right time of year, than any other time. Here is a cow that is freshened and gives 25 lbs. of milk and you subject her to an increased ration suitable to this one cow, and at the end of six weeks after that you can bring her up until you have a flow of milk from 36 lbs. to 41 lbs. just as well as not. If you neglect this cow ten day after she comes in, in six weeks she will be giving you 16 lbs. of milk. Which will you have? It is all up to you.

Unless you want to ask some questions I am going to quit. Up in our state they ask a great many questions. We cut our talk short and ask a great many questions.

I thank you very much for your attention.

By the President.—Prof. Haecker will give us a short talk now, and we shall have the pleasure of listening to him again.

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#### PROF. HAECKER.

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I supposed this meeting would be held in a lecture room where they would have a blackboard and when I give my address would like to have one.

Mr. Glover is in a work in which I am very much interested, and I think it means a great deal for the State of Illinois, the facts he is going to bring out.

As you probably know I am doing experimental work with the dairy herd in the Minnesota Dairy School, and I have brought out some facts of the comparative merits of the two types of cows and endorse everything that has been said on that point.

The dairy cow is a wonderful producing animal. It seems at times almost impossible the amount she will get out of food, and yet our records have been kept carefully, and never any feed given but what a record has been made of it, so we know practically what the animals are doing for us.

Why I endorse everything that has been said in regard to the dairy cow is because I am a great friend of the dairy type cow and know something about what she can do. The dairy type cow will earn \$30.00 to \$35.00 more annually net than the other cow. Just think what this means. You are milking a million in this state. How much this would mean in addition to what they do get, or could get with the ordinary cow.

But in connection with this work there has come out some other things that are really of more importance to the average dairy man, to the average dairy farmer. We have been told this afternoon that we should have the dairy bred cow, the thorough bred pig, hog and calf. I say, yes, if you have the thorough bred man to take care of them. It is only under the special care that these animals will bring the returns that we show in our records. Sometimes I think that this common cow that we find on the western prairies has adjusted herself to the peculiar kind of a beast that she is; that she has just about squared herself with the average western farmer. I think there is a good deal in that. These thoroughbreds that we are speaking of are animals that have squared themselves with men who understand these things and they produced these high producers because of the intelligence and special interest of these breeders.

Now, would these animals do anywhere near as well if they were handed over to the happy-go-lucky, thoughtless, every day farmer of the west? Sometimes I think that she would not do as well as the common cow in doing for him. She has adjusted herself to the kind of treatment that he gives. That is heresy, isn't it? That's talking backsliding. I don't know about that. I believe in making subjects and giving thoughts along the lines that are practical and possible for farmers to follow.

The average farmer is not going to get a thoroughbred cow. If he did, he would not know how to take care of it. These men with common cows want to know what to do, and what do I tell them? I tell them I have now some thirty or more of these common scrubs, and have yet to find a cow that didn't pay in the dairy under proper handling and management. Isn't that an encouraging word to the farmer that has common cows? He will say, "Why, now here is something that we can take hold of. This man says he has weighed every pound of food; that he knows exactly what his cows have done, and has yet to find a cow that is not profitable in the dairy."

I go down some counties and visit the farmers from creamery to creamery and they all have the common cow. I go down to Freeborn county and still find the common cow, the common farmer. I can travel all over that state and find nothing else. Here and there there may be a few animals that are dairy breeds, and, let me tell you, there are not as many as there were ten years ago, and I am very sorry to admit it. We have during the past decade been using the common cow in Minnesota.

Twelve years ago, as you all know, the southern part of that state was in debt, terribly in debt. Where are our farmers now? Paid the mortgage, sent their young people to school, gone up into Canada and bought a large tract of land, all with this common cow. These facts we might just as well meet. This common cow has made money for them. Why? They were in a pretty hard row of stumps. They gave her plenty of feed; milked her regularly; got the best for her that they knew of. If you do the same, I think you will get similar results.

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## BACTERIOLOGICAL CONTAMINATION OF MILK.

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By Prof. H. L. Russell, University of Wisconsin.

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Mr. Chairman, Ladies and Gentlemen:

I shall try and make my remarks very brief. The subject which I have been asked to speak on is in regard to the bacteriological contamina-

tion of milk. I hardly need say to a dairy audience that the production of wholesome milk is a necessary thing in first-class dairy productions.

Until a few years ago the feeding of animals for the production of milk was not the important factor, but within the last ten or fifteen years there has come into dairying a literally new factor. It is, of course, a factor that has been operative from time immemorial, but we have only begun to appreciate that the quality of milk was dependent upon the presence or absence of certain living organisms. These organisms are what is known as bacteria, and the science which treated of these living organisms was relatively a new science. It is a science, however, which is most intimately related to dairying, and the importance of this is becoming more and more appreciated.

The word bacteria recalls in the mind a vision of diseases. We hear so much about microbes and bacteria of this and that, that we look upon these organisms as being the agents in the production of disease. Some of them are agents of this sort, but the great bulk of bacteria belong to an entirely different class. Some of them are even beneficial, and a great many of them are indifferent to us as human beings. In this class of living organisms we are dealing with something which is alike capable of growth, and the same conditions which are necessary for the growth and development of ourselves, are to plants likewise necessary for the growth of these bacteria species. They must have light, proper temperature, the proper food supply, the same as is necessary for all kinds of living things.

A recollection of this fact is of importance because it teaches us that we have in milk the conditions which are more suitable for the growth of this type. It is strange that we have here a common meeting ground of the highest and lowest forms of existence known.

Milk, as you know, is that substance which is designated by nature for nourishment of the young.

Now the changes which take place in milk are changes which are conditioned upon the presence or absence of this type of germ life. We have the souring of milk, the transfer of milk into the slimy or ropey milk, bitter milk, etc., which are some of the changes and which are wont to bother the dairyman.

It is only recently, within the last few decades, that an explanation of the cause of these changes has become apparent, or has become

thoroughly instilled in the minds of those who study them, and it will take undoubtedly a number of years before the information gets into the minds of the men who are actually concerned in the production of milk.

Now this talk is, of course, of practical importance to the dairyman, because he is the man who is concerned in the production of milk, and if I can speak in a way which would convince him of the necessity of caring for his milk, not only after drawn from the animal but even before drawn from the animal, for the possibility of bacteriological contamination in milk is not alone to be dealt with after drawn, but should be taken into consideration before.

Some of these bacteria which we find in milk are favorable; some of them are good and some bad; many of them are indifferent. It is not wise for us to decry these organisms from this point of view.

You take the man who is producing milk for the purposes of milk supplying, and to this man the bacteria are more or less undesirable. If you can reduce the germ content of milk to the lowest possible existence you improve its quality. If for butter making purposes or manufacture of cheese, it is absolutely necessary that you have some germ life. The question of practical import is, how to control it?

Now as milk is secreted in the body of the animal and it is made in the glands of the udder, it contains no germ life in the milk of a healthy cow. There is no germ life there as it is secreted. That milk as it is drawn is perfectly sterile, perfectly free from germ life. It does become contaminated to some extent during the process of withdrawal, but the number of germs drawn from the animal is relatively small which exist in milk when we consume it on the table or take it to the factory to be worked up into dairy products. The conditions in milk permit of the exceeding rapid development of these organisms, so that from a numerical point of view we have simply a large amount of this germ life under ordinary conditions. Take a glass of milk such as you have on the table and make a bacteriological examination of it and the number of organisms of living cells which are actually present in a glass of milk of ordinary, normal character, would exceed in number the number of human beings on the surface of the globe, measured as they are in hundreds of millions.

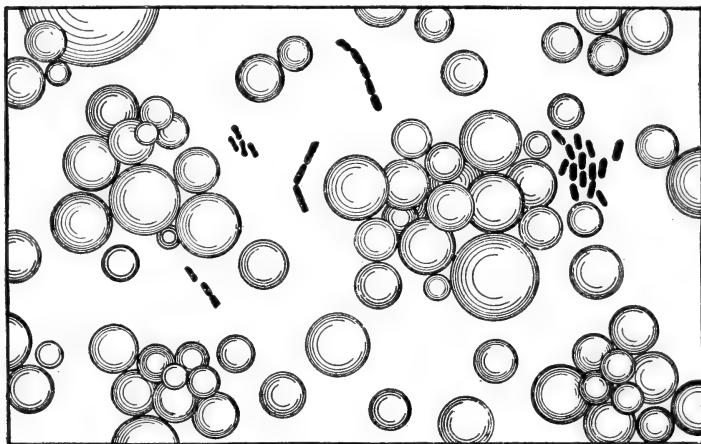
Now we naturally shrink from a statement of that sort, and think that this large amount of germ life must produce some bad effects on our

systems. The reason why it does not is because from a human point of view, they are not able to produce disease. They are capable of changing the nature of milk to a very great extent.

It is very important for the dairyman to know the nature of infection, and in order to bring this before you in a way that it can be more readily appreciated, I have brought down with me a few slides which we will throw on the screen as illustrations.

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SLIDE NO. 1—BACTERIA AND FAT GLOBULES.



NO. 1.—Microscopic appearance of ordinary milk showing fat, globules, and bacteria in the milk serum. The cluster of bacteria on left side are lactic acid forming germs.

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Suppose the Washington monument was made of bricks of ordinary size—a structure 70 feet square at the base and 500 feet high. If every brick in the structure represented a germ there is often enough bacterial life in a single teaspoonful of milk to equal in number the bricks which would be put in such a structure, in numbers about 29,900,000.

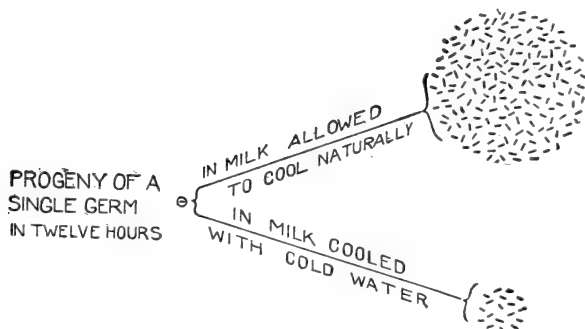
In what way do we account for this enormous discrepancy between the condition of the milk as it exists in the milk glands of the cow and as it passes through the weigh can. This great variation is due to two fac-

tors; to the introduction of germ life in varying qualities, and to the presence of conditions which favor a rapid growth and development of the organisms originally seeded in the milk.

The composition of milk is such that bacteria find in it the most favorable conditions for growth, all the necessary food nutrients are there to promote rapid changes, and if the temperature is favorable a single organism will multiply and increase its numbers many fold in a short period of time.

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SLIDE, NO. 2.—TEMPERATURE AND BACTERIAL GROWTH.



NO. 2.—Showing the effect of cooling milk on the growth of bacteria. The beneficial results of early chilling are readily apparent.

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The factors which account for this infection may be briefly summed up in cleanliness and temperature. Unless the temperature of milk is kept at a point where bacterial multiplication cannot go on even a few germs in the course of hours will be able to increase so that the aggregate will be very large. But our purpose is to point out more specifically the way in which bacteria gain entrance to milk.

We may divide the infection of milk into several factors:

Utensils.

Fore milk.

Dirt derived from air and cow.

The ordinary cleaning that is given to pails, cans, strainers, etc., takes out only a portion of bacteria. Just to the extent that carelessness prevails in this part of the dairy work, just to that extent will these utensils contain a larger number of organisms. The kind of utensils has considerable to do with the ease with which they are cleaned. Wooden pails are to be avoided. Tinware is now so generally used that but little need be said as to other kinds of vessels, but much of the tinware now on the market is so imperfectly constructed as to shelter germ life. The sharp re-entering angles to be noted in pails, and the open seams in the sides, are harbors of refuge to the many bacillus in his fight for existence.

What the cans are used for will also to some extent determine the kind of organism found in the same. If one uses the same set of cans to carry home the by-products of the factory—fluids known to be rich in bacteria and generally in an advanced state of fermentation—then it is not surprising that tainted milks will often be the rule. Too often the cans are imperfectly cleaned at home and the inevitable result is an "off" milk the next day. The prevalence of gas in the milk delivered to factories making Swiss cheese, an industry that is very important with us in Wisconsin, is entirely accounted for in this way.

A purely practical experiment of storing milk under the same conditions in sterile and unsterile cans will teach any one the value of this point. Such milks kept in cans as ordinarily cleaned but not sterilized will sour a number of hours sooner than one kept covered in a steamed pail. The number of organisms in the two milks will always vary—that in the sterile pail containing less. The germ content of cans and pails may also be determined in another way by rinsing out the vessel with a known quantity of sterile water and then determining the number of organisms in the same. The following data on several pails so treated shows how many bacteria remain in the pail:

Pail No. 1—First washing .....	7,388,900
—Second washing .....	157,000
—Third washing .....	5,800

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7,551,700



Pail No. 2—First washing .....	1,782,500
—Second washing .....	100,000
—Third washing .....	62,500
	<hr/>
	1,945,000

When one considers that these pails were also steamed for a moment after thorough cleaning (as is the custom in handling the milk from our University herd) it indicates that the number found under average conditions would be even greater than this.

The second factor to be considered is one that is generally overlooked by most people. It is the germ life that comes from the inside of the udder. We said at the outset that milk was secreted germ-free; as made in the gland cells it is sterile, but as soon as it flows out into the milk cistern it comes in contact with bacteria. If we look at the section of a cow's udder it is easy to see why this is so. The direct communication that it is possible to establish between the outside of the udder and the secretory cells permit more or less of germ life to work their way up the teat into the milk cistern and so on into the numerous folds and convolutions of the smaller channels. Here are ideal conditions for growth if any germ does establish itself. Moisture, food, and warmth abound and this is all a microbe needs to wax fat. In the few particles of milk that inevitably remain in the udder, these bacteria thrive and grow. To such an extent is this so that the first few streams drawn always contain a very much larger number than at any subsequent time. The milk secreted and withdrawn toward the end of the milking is much more nearly as the cow made it, because the great majority of these organisms are washed out by the fore milk just as a sewer is flushed with the heavy flow of storm water.

Generally speaking the forms found in the udder are the distinctively milk bacteria. They are those forms adapted by nature to grow in milk. They are for the most part in a vigorous, active condition, rapidly growing because of the favorable environment in which they have been placed.

The number of microbes that has been found in my experience in the fore, middle and last milk of a milking is as follows:

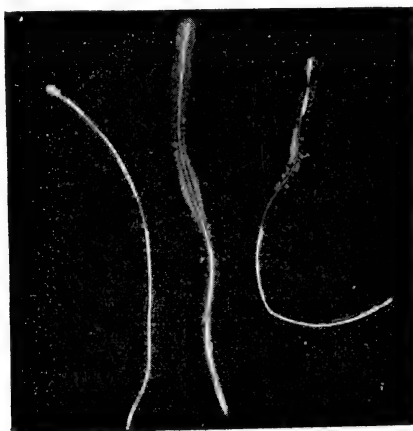
20 c. c. fore milk, 324.

20 c. c. middle milk, 60.

20 c. c. strippings, 44.

In these cases it should be remembered that contamination from all other sources was excluded. The end of the teat was disinfected and a sterile flask placed directly over the same so that no bacteria could gain access from the outside.

The third factor to which reference will now be made is the influence which the animal herself directly exerts on the germ content of the milk; also the contamination which comes from the dust in the air of the barn. The coat of the cow could be provided in no better way to aid in the distribution of bacteria. Unless kept thoroughly clean, her flanks, under parts and tail become coated with evident filth. Even where this material is not allowed to accumulate there are innumerable dust particles caught in the hair. The majority, of these contain organisms of all sorts bacteria predominating. See what is found on a single hair. By planting in gelatine these hairs taken from the apparently clean coat of a cow, it is possible to study the number and kind of organisms that find their way



NO. 4.—Showing the bacterial contamination arising from hair. These three hairs were allowed to fall on a sterile gelatine surface. The adherent bacteria developed readily in this medium and the number of bacteria thus introduced into the milk from these hairs can be estimated by the developing colonies that show as irregular protuberance along the line of the hair.

into the milk. Is it any wonder that milk that contains dirt sours and spoils more readily than clean milk? There are but few things richer in germ life than the filth particles coming from the fecal discharges of animals or the dust and dirt of hay, bedding, etc.

Many think where they have strained out these particles that are visible to the naked eye, that they have removed the source of trouble, but let me tell you, if bacteria adhere to hairs, dirt particles, etc., and in this way find their way into milk, a removal of these larger particles by straining does not remove the danger. In this way you may have removed the visible dirt, but what of the invisible dirt, the living germs that will for the most part pass any strainer that will clean milk. These tiny forms are washed through into the milk, there to grow and develop. To remove them from milk after they have once come in contact with this fluid is only to lessen the difficulty, it does not overcome it. They should be kept out. Again some of the dirt and filth that drops into milk this way dissolves, and so if bacteria are adherant to any particles that are soluble they must float off in the fluid as the solid substance passes into solution.

The conditions with reference to the character of bacteria coming from the manure are somewhat different from what they were years ago. With the more intense feeding of cattle, particularly the increase of nitrogenous elements, the manure is softer, more fluid, and contains more bacteria. As many as 375,000,000 of these organisms per gram were found in fresh manure.

How can the germ life that finds its way into milk from this source be lessened? The experiment of exposing sterile gelatine plates under the animal and noting the number of colonies growing on these plates will give one an approximate idea of the importance of this point. From experiments on our own herd I have estimated that from 3,000 to 10,000 bacteria fall into an open 10 inch pail per minute. To get at this number per unit of volume, one can multiply this number by the number of minutes necessary to milk and then divide by the amount of milk in the pail (expressed in cc.) The amount thus contributed can be quite readily determined.

Naturally these bacteria are in a dried condition and as such are readily dislodged. Just as in the street where every wind current, however slight, whirls up from the street dust innumerable organisms, so

from the germ-rich udder and flanks of the cow every movement of the cow during milking dislodges some of these forms and they fall into the milk.

If a surface is moist such movement is not possible, and this teaches us how this factor of pollution can be greatly reduced. If the bag and flank is thoroughly moistened so as to prevent dislodgment of these dust moats, the difficulty would be largely removed. In an experiment conducted by the speaker where an animal was milked under ordinary conditions and also where another was washed, the number of bacteria developing on an exposed sterile plate was in the first case over 3,000, while the other was only 115.

The air of the barn may be replete with bacteria from the dirty feed, as hay and straw, and so a can of milk standing open in the barn during milking may acquire a considerable number of bacteria in this way. The figures actually obtained by test show that tens of thousands fall into an open pail during feeding in comparison with a few hundred or one or two thousands where conditions are more practically controlled.

#### Relative Importance of Foregoing Factors.

No uniform rule can be given that will show the effect of the factors of pollution as they exist in all cases. Naturally at one time one special factor will predominate, while again some other factor assumes more prominence. Perhaps the pollution arising from dirt derived from the animal is subject to most variations. With some patrons no attempt is made to clean the udders of animals even though the same is covered with slime and dirt from wading in stagnant pools and pastures. This factor in the minds of the majority of people is generally regarded as that which furnishes a large quota of organisms to the milk, perhaps the largest number of any.

In our experiments, however, such has not been the case. The pollution coming from particles falling into the pail is only a small fraction, probably less than one-tenth. In all probability this is due for the most part to the fact that our university herd is kept considerably cleaner than the average and therefore this pollution is lessened.

In our experience both the fore milk and the utensils are the main factors of pollution; although the pails are steamed for a moment they nevertheless often contain a considerable number of germs. The fore milk with us assumes a relatively high numerical estimate, but that is probably because other conditions are more improved. It probably makes but little difference in the germ content of fore milk whether the herd is kept in the ordinary manner or special endeavors used to keep it in the best form.

There is no question but that careful handling of the milk will result in a very great reduction in the number of bacteria that find their way into the same. This is evident not only from bacteriological tests made on milk drawn under the best, and also under ordinary conditions, but also from the increase of the keeping quality of the product.

In the establishment of sanitary or certified dairies, where milk is handled under most modern conditions, the increase in keeping quality is very marked; such milk often remaining in a sweet condition for several days, and sometimes a week or more. Whether this is important for the butter or cheesemaker is perhaps another question. It is hardly probable that the average milk producer can be induced to take as great care in the securing and handling of the milk as is done in dairies that produce milk under the sanitary or certified plan, but there can be no question as to the effect which such methods would have upon the quality of milk if these careful methods of handling were carried out. Even where milk is destined for factory purposes, that is, made into butter or cheese, it is much better to have the germ life reduced to the lowest number, and so control the kind of fermentation than to have the milk highly infected with bacteria through slovenly methods of handling. If this is done the maker can have the fermentation under his control, and by the addition of a starter, which he can choose, he can vary the product to suit the demands of his trade, which he cannot do if the raw milk is brought to him in a dirty condition and in an advanced stage of fermentation.

Dairymen have learned many of these lessons in the severe school of experience, but the reasons for the same is so palpably plain in the light of bacteriological explanation that discussion would seem unnecessary. It remains to be seen whether the words of the eminent German scien-

## SLIDES NO. 5—A AND B.



PAIL NO. 1.



PAIL NO. 2.

No. 5. A and B.—Showing effect of careful milking on bacteria in milk. A is a plate culture made from a droplet of milk as ordinarily secured. B is the same made from an equal quantity of milk that has been more carefully handled. Each white spot is a colony that is developed from a germ that was originally present in milk. Owing to the exclusion of bacteria by careful milking, plate B has fewer colonies.

tist, Prof. Fleischmann, will much longer remain true, when he says that "All the results of scientific investigation which have found such great practical application in the treatment of diseases, in disinfection, and in the preservation of various products are almost entirely ignored in milking."

By the President.—Mrs. Pumpelly is ill and not able to be with us. We will now listen to the reading of the scores on butter and cheese by Mr. Caven.

### CREAMERY BUTTER

Chas. J. Allen	Loda	93
W. S. Hollister	Pana	95
D. C. Benton	Kaneville	93
Jas. H. Hilfiker	Manhattan	93
W. E. Mann	Pecatonica	92
A. E. Thompson	Poplar Grove	95
P. J. Springsteen	Egan	92½
Gus Krumpel	Frankfort Station	94
G. W. Lorah	Sugar Grove	94
F. R. Palmer	Pearl City	85
Grant Mallory	Freeport	95
C. L. Bartholomew	Cedarville	91
Mat Ludwig	Lockport	93
Wm. Kruse	Ontarioville	85
Otto Kretchmer	Ontarioville	85
Anton Bueler	Bemes	95½
David Van Patten	Plainfield	91
Geo. Bloyer	Harper	91
Wm. Carbaugh	Nursery	87
E. L. Hovey	Capron	93
H. Nolan	Hinckley	98
P. J. Harkenhein	Malta	88
W. K. Tindall	Malta	88

A. R. Montgomery	Capron	86
H. R. Duell	Franks	96
A. J. Sally	Garden Prairie	93
Geo. W. Hoppensteadt	Beecher	95
G. C. Hopkins	Ashton	97
Peter Nelson	Creston	93
L. H. Knigge	McHenry	92
A. B. Campbell	Oregon	96
R. Cruickshank	Greenwood	93
Lewis E. Johnson	Byron	93½
C. D. Coffin	Neoga	81
W. J. Hyne	Evansville, Wis.	97½
I. G. Machamer	Lanark	92½
K. B. Carpenter	Thomson	89
C. W. Davis	Woodstock	92
F. M. Hermann	Germantown	86
G. A. Cutler	Belvidere	93

## DAIRY BUTTER.

Irwin Nowlan	Toulon	91
Davis Bros.	Fairfield	75
Eli I. Crosior	Utica	86
John Christ	Washington	88
Mrs. H. P. Purviance	Lincoln	93
L. A. Powell & Son	Bowen	87

## CHEESE.

J. R. Biddulph	Providence	92
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On the butter that was marked off on flavor, the most of that butter the judge wrote on the score card that it was bitter, had a bitter flavor.

The highest score is 98, H. H. Hopkins of Hinckley, and it is the only tub of pastuerized butter in the exhibit.



Mrs. Purviance has the highest score, 93, on dairy butter. We expected to get quite a few entries in this part of the country on dairy butter, but received eight.

The creamery entries were fewer than we get in the northern part of the state, although we think we got a fair showing for down here. Usually the entries in the creamery class are about 80 in the northern part of the state; here we received about 45.

By the President.—I wish the dairymen and the women butter-makers would take more interest in this association. We gave a very good premium this time, but they don't seem to have taken advantage of it, and I again invite you to come and be near to us. We want to give a special invitation to the ladies and to the president if she is here of the Ladies' Association and tell her to extend our invitation to their association to come and be with us.

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#### RECORDS OF INDIVIDUAL COWS ON DAIRY FARMS.

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By Arthur J. Glover, B. Agr., Chief Assistant in Dairy Husbandry, Agricultural Experiment Station.

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#### Summary.

Eight herds are reported in this bulletin, containing 144 cows that have completed a year's work. The eight dairies had 176 cows at the beginning of the test, but 32 of them were sold before the end of the year.

Some of the herds returned their owners a good profit, others a small profit, and one herd was kept at a loss. Six herds out of the eight contained cows that did not pay for the feed consumed.

In estimating the profit or loss on a cow it was counted that the calf paid for her keep while dry and the skim milk paid for labor.

The cow that yielded the most product gave 8,949 pounds of milk, and made 472 pounds of butter. The poorest cow produced 1,842 pounds of milk, 68 pounds of butter, and the average production for all the herds, except Gurler's (D), was 4,721 pounds of milk, 3.67 per cent fat, 172 pounds of butter fat, and 202 pounds of butter.

It would not give the average production of the ordinary cows in Illinois if Gurler's herd were included, for he has been applying the scales and test for a number of years, hence his improved dairy. It should also be considered that the men who took up this work had been interested in improving their dairies, and undoubtedly have better cows than the average.

The most profitable cow gave a net profit of \$57.22 and the poorest cow was kept at an actual loss of \$17.83. The average net profit was \$9.96 per cow.

The above facts show clearly that the average production of the Illinois dairy cow can be doubled and the profit increased fourfold.

This can be done with little expense to the farmer. It will require better care and better feed for his stock, and the application of the scales and the Babcock test so that he can select and breed his animals more intelligently.

The results in this bulletin indicate that good care and good feed with judicious selection are the prime factors necessary for profitable milk and butter production.

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For over a year the Department of Dairy Husbandry of the University of Illinois has been conducting field work among the dairymen of the state. A number of them were persuaded to weigh and sample each mess of milk a sufficient number of times during the year so that the performance of each cow could be estimated with a considerable degree of accuracy. It has been demonstrated by a number of our experiment stations that many cows are kept in the dairy at a very small profit and some at an actual loss. In order to determine the facts and to lead the dairymen to realize their full force and meaning a man was sent into the field to persuade a number of them to keep a record of every cow in their herds. While this bulletin gives no facts new to science, yet it presents

a line of work on which we have but little data and it brings the farmers face to face with facts that exist upon their own farms. It shows them that some herds are kept at a good profit, some at a small profit, and others at an actual loss.

### How the Farm Test Was Made.

The farmers who took up this work were required to weigh and sample the milk from each cow in the herd every seventh week for fourteen consecutive milkings. After each cow was milked the milk was poured into a weighing pail, weighed, and the weight recorded on a milk sheet directly under the cow's name. A small sample of milk was then taken with a sample dipper or a milk thief and put into the sample bottles. Corrosive sublimate tablets were used to preserve the samples of milk. Instructions were given to each man to shake the composite samples each day so as to mix the fresh samples with the rest of the milk and keep the cream from becoming dry or hard on the sides of the bottle. The jars that were used for keeping the composite samples were one pint, tin top, covered bottles. When the period of weighing and sampling was completed the samples were tested either on the farm or at the creamery.

### Apparatus.

The things necessary for carrying on the work were: A spring scale for weighing the milk; a small dipper or milk thief for taking the samples; bottles for holding the composite samples; corrosive sublimate for preserving them; and milk sheets. All these were furnished by the Experiment Station. Each cow was given a name or number which was placed at the top of the milk sheet so that the weights of milk could be put directly under her name or number. Cut No. 1 shows all the necessary apparatus for carrying on the work, and Table I is a sample of a farmer's milk record.

Table I.—Sample of Farmer's Milk Record for One Week, from July 30,  
p. m., to August 6, a. m.

Milk—Pounds.											
Number of the Milking	Spotty No. 1.	Black No. 1.	Black No. 2.	Bottle.	Milly	Little Lamie	Alice	Belle	Sleepy Eye	Roaney	Pet
1.....	20.5	14.1	11.3	15.0	15.4	10.9	6.9	7.4	7.5	5.5	15.1
2.....	13.5	6.8	6.5	10.2	13.2	8.3	5.2	3.9	5.1	3.9	10.3
3.....	22.2	16.8	11.7	15.0	17.0	11.0	6.7	7.9	7.7	5.2	15.8
4.....	14.2	5.2	8.2	10.7	14.2	8.5	5.2	4.9	4.6	3.9	10.9
5.....	20.3	15.7	6.0	13.7	16.3	10.7	6.8	6.5	7.3	4.9	15.7
6.....	16.7	7.0	9.2	11.9	15.6	9.5	5.1	5.1	6.1	4.6	12.2
7.....	18.5	15.5	4.7	14.1	16.7	9.6	7.0	6.0	6.6	5.0	14.5
8.....	16.0	7.8	7.3	11.2	14.4	8.7	5.0	4.9	6.2	3.9	14.7
9.....	22.0	14.5	13.5	16.4	18.5	10.7	6.9	7.2	6.9	5.3	15.8
10.....	14.0	9.5	6.9	10.5	15.0	8.3	4.8	4.6	5.3	3.6	11.4
11.....	19.9	9.8	4.0	12.9	17.5	11.0	6.7	6.1	7.0	5.2	14.9
12.....	14.5	13.0	6.8	11.5	14.5	8.1	4.4	4.6	5.8	3.9	11.3
13.....	22.6	13.2	6.7	16.1	18.4	11.6	8.6	7.4	7.3	7.8	16.1
14.....	15.4	7.1	8.8	11.3	14.7	8.6	4.3	5.2	5.9	4.2	11.7
Total....	250.3	156.0	111.6	180.5	221.4	135.5	83.6	81.7	89.3	66.9	190.4
Fat, %..	3.2	2.8	3.2	3.5	3.2	3.4	4.6	4.0	4.6	4.4	3.0
Fat, lb..	8.00	4.36	3.57	6.31	7.08	4.60	3.84	3.26	4.10	2.94	5.71

#### Arranging Apparatus.

A considerable amount of time can be saved by arranging scales, sample bottles, and milk sheets in such a way that the weighing, recording the weight, and sampling the milk can be done with as few steps and motions as possible. After the most desirable place in the barn has been chosen for weighing and sampling, the scales can be suspended from the ceiling so as to hang near the milk sheet which can be tacked to a board and hung on the wall, or fixed on an inclined shelf projecting from the wall. After the milk from each cow is weighed, a sample should be taken and placed in the jar bearing the cow's name or number. The sample bottle can be arranged on either side of the milk sheet, or, if con-



Cut 1.—Scales for Weighing Milk. Record Sheet and Composite Samples.

venient, above it. If there are two or more milkers, the sample bottles can be arranged so that each milker will have his bottles together and arranged in the same order in which the cows are milked. This method saves time in finding the right sample bottle.

#### Time Consumed in Weighing and Sampling.

The length of time required to weigh and sample the milk depends entirely upon the quickness of the man who is doing it. Some men will say that it takes but little time to weigh and sample each cow's milk, while others complain of the length of time necessary to do the work.

It will take, on an average, about one minute to each cow, or two minutes a day. This indicates, for the seven weeks that it is done during the year, about one hour and thirty-eight minutes for each cow tested. With this amount of time expended, the farmer can have a complete record of every cow in his herd. From this, with a knowledge of what he is feeding, he will know at the end of the year whether she has been a source of profit or loss to him; and furthermore, he will know from which cows to select heifers for his dairy. Considering the time that is consumed in doing this work, it seems strange that more dairymen do not have their herds tested. Many of them can weigh and sample each cow's milk every seventh week, and then have the buttermaker test the samples for them at the creamery. With the per cent of fat and the weights of milk they can estimate for themselves the performance of every cow in their herds. The importance of doing this work will be shown further on in this paper.

#### **Calculating the Amount of Milk and Butter Fat.**

The milk was weighed and sampled during the fourth week of the seven-week periods. From the total amount of milk that each cow gave during this time, and the per cent of fat, was calculated the amount of butter fat produced in the week. From these results were estimated the amount of milk and butter fat each cow produced during the three weeks before, and the three weeks following the test. The cow's yearly record was made up from these tests, and in this way the total amount of milk and butter fat that she produced during the entire year was determined. It may be objected to that this method did not secure results absolutely correct. On this it may be said that the chief object was to secure data from which cows could be compared with each other and that this object was fully attained even though the totals may have been either slightly too large or too small. Check methods show, however, that the data are very close to the actual amounts produced. In many cases the dairymen also kept an approximate account of the grain and roughage that each cow consumed during the year. Where this was done the records are of exceptionally high value, for they clearly show the profit or loss of every cow kept in the dairy.

### The Different Methods that May Be Used in Weighing and Sampling.

There are several ways that records from each cow in the dairy can be obtained. The method used in obtaining the records given in this bulletin was as follows: The farmer, every seventh week, weighed and sampled each cow's milk for fourteen consecutive milkings. The amounts of milk yielded each day were added and from the per cent of butter fat which the milk contained, was determined the amount of butter fat each cow produced during the week. From these results were estimated the amount of milk and butter fat each cow produced the three weeks before and the three weeks following the test.

The Dairy Department of the Wisconsin Experiment Station had its patrons weigh and sample one day each week for the whole year. From the different weights and tests the amount of milk and butter fat that each cow produced in the entire year was estimated.

The testing of the milk each week is too much for the average farmer to do, but taking composite samples of milk of several milkings gives a very good average of the per cent of fat contained in the milk, and can be done by any one if he chooses. Fairly accurate results can be obtained by weighing and sampling the milk every thirteenth week and calculating the results the same way as when the weighing and sampling were done every seventh week. The method of weighing and sampling each cow's milk every seventh week for several consecutive milkings, or three and one-half days, gives very good results. The results can be multiplied by two which would equal the amount of milk and butter fat produced for one week, then estimated the same as if the weighing and sampling were done the entire week. The composite samples that are but three and one-half days old, are in better condition for testing than samples that are a week old. The farmers will take more pains with the work if it does not become tedious to them.

The accuracy of records obtained by weighing and sampling each cow's milk at regular times during the year is often doubted. As a check a comparison was made between the amount of milk and butter fat sold from two farms to a creamery and the amount of milk and butter fat as determined from weighing and sampling each cow's milk every seventh week for fourteen consecutive milkings during the year. In one case

there was found a difference of 2.2 per cent of butter fat, and .0015 per cent in milk, making a difference of 4.67 pounds of butter fat and 8.09 pounds of milk per cow; in the other case a difference of .038 per cent fat, and 1.98 per cent in milk, or .27 pounds of butter fat and 120.3 pounds of milk per cow. From these results it is seen that by carefully weighing and sampling each cow's milk every seventh week during her period of lactation records can be secured which are substantially correct.

### **Object of the Work.**

There is no better way of finding out the merits of a dairy animal when giving milk than to use the scales and the Babcock test. With the weights of milk produced, the per cent of butter fat and the length of her milking season, together with the feed consumed, the value of a cow for the dairy can be determined. The object of getting dairymen to do this work is to determine which of the individual cows in their herds are the most profitable, so that the owners may cull out the poor cows and keep the profitable ones; to show them the importance of better feeding and care for their stock; and the importance of selecting better sires for their herds. A dairy animal should be selected for the amount of milk and butter fat which she yields during the year rather than on points of fancy or form. It is a reasonably safe rule in selecting dairy cows to go upon the results obtained from the scales and the Babcock test. If she is a good breeder, that also should be taken into consideration. If the performance of each cow in the herd is known, the heifers can be selected from the best cows and when these heifers become fresh the test should be applied to them and the inferior ones culled out. This can only be done when we have an intelligent understanding of each cow and her capability of producing milk and butter fat.

### **Elements of Danger in the Use of Scales and Babcock Test.**

While the scales and Babcock test can be of great service in the selection of our dairy animals, they must, however, be used with judgment. Dairy cows have their "off years," and this must be considered when the herd is being culled. If we do not bear this fact in mind, we are apt to



sell some of the best cows from our herds. The writer has in mind the 1898 cow Sweet Briar, of the Minnesota Experiment Station, that produced for ten years an average of 358.07 pounds of butter a year, while in 1898 she produced only 206.62 pounds of butter, but in 1899 she made 306.53 pounds, and in 1901 370.53. If the merits of Sweet Briar had been wholly based on the work she did in 1898 she would have been classed as a very ordinary cow, and perhaps sold. The great value of scales and Babcock test lies in their continued use in the dairy herd and not in one year's test. Good heifers usually come from the best dairy cows, but it sometimes happens that a promising heifer may do very poorly the first year. In such cases the heifer's individuality together with her breeding should be considered before she is sold. The testing of cows should, however, be carried on in every dairy if a systematic selection is to be made.

A good cow seldom has two "off years" in succession.

#### **The Variation in Flow and Per Cent of Fat in Milk.**

It has often been asked why it is necessary to weigh and sample each milking for a week. By weighing and testing each milking separately we usually find considerable variation in milk yield and fat content. The following tables show to what extent a cow will vary in quantity of milk and per cent of fat from one milking to another. These tables are taken from records of cows that were tested for the Holstein-Friesian Advanced Registry.

The above table readily shows the importance of weighing and sampling the milk for more than one milking, if the average test of the cow is to be obtained. Maid of Cloverdale, for example, tested on the morning of September 25, two per cent, and at noon, September 26, 4.50 per cent. Had either been taken as her actual test it would have been very misleading, for her average test for that particular week was 2.99 per cent.

#### **The Basis Upon Which the Profit or Loss of the Cow Is Computed.**

It is very difficult to express the true value of the dairy cow in dollars and cents. But since the profit or loss of more of the cows tested has

Table 2. Showing the Yield of Milk and Per cent Butter Fat of Each Milking for One Week.

ECHO BETTINA HERBERT'S RECORD						
1902	Milk, lb.	Fat, p. c.	Fat, lb.	Total milk, lb.	Total fat, lb.	
March 10, Morning .....	12.3	4.60	.5658	31.4	1,2411	
Noon .....	9.0	3.80	.3420			
Evening .....	10.1	3.30	.3333			
March 11, Morning .....	14.2	3.10	.4402	35.2	1,0902	
Noon .....	10.0	3.20	.3200			
Evening .....	11.0	3.00	.3300			
March 12, Morning .....	15.6	3.70	.5772	38.5	1,4532	
Noon .....	11.0	4.20	.4620			
Evening .....	10.9	3.80	.4142			
March 13, Morning .....	17.6	3.30	.5808	41.8	1,4709	
Noon .....	12.2	4.05	.4941			
Evening .....	12.0	3.30	.3960			
March, 14, Morning .....	16.5	3.10	.5115	40.4	1,35485	
Noon .....	12.2	3.70	.4514			
Evening .....	11.7	3.35	.39195			
March 15, Morning .....	18.0	3.50	.6300	42.9	1,6635	
Noon .....	12.6	4.20	.5292			
Evening .....	12.3	4.10	.5043			
March 16, Morning .....	17.2	3.50	.6020	43.0	1,6088	
Noon .....	13.0	4.20	.5460			
Evening .....	12.8	3.60	.4608			

## MAID CLOVERDALE'S RECORD

Sept. 23, Morning .....	18.1	2.80	.506	45.3	1,322	
Noon .....	11.5	3.00	.345			
Evening .....	15.7	3.00	.471			
Sept. 24, Morning .....	18.4	4.20	.772	47.0	1,580	
Noon .....	13.0	3.10	.403			
Evening .....	15.6	2.60	.405			
Sept. 25, Morning .....	16.7	2.00	.334	46.5	1,250	
Noon .....	16.4	3.30	.541			
Evening .....	13.4	2.80	.375			
Sept. 26, Morning .....	17.3	2.60	.449	47.2	1,544	
Noon .....	18.0	4.50	.810			
Evening .....	11.9	2.40	.285			
Sept. 27, Morning .....	20.4	2.70	.550	50.1	1,395	
Noon .....	14.5	2.90	.420			
Evening .....	15.2	2.80	.425			
Sept. 28, Morning .....	18.5	3.80	.703	47.5	1,442	
Noon .....	14.5	2.80	.406			
Evening .....	14.5	2.30	.333			
Sept. 29, Morning .....	20.9	3.20	.668	51.1	1,488	
Noon .....	14.3	2.40	.343			
Evening .....	15.9	3.00	.477			

been given, it is perhaps well to state the basis upon which the profit or loss was calculated. The value of the product that the cow yielded was based upon the amount of butter fat that she made, and the market price of butter fat at the time.

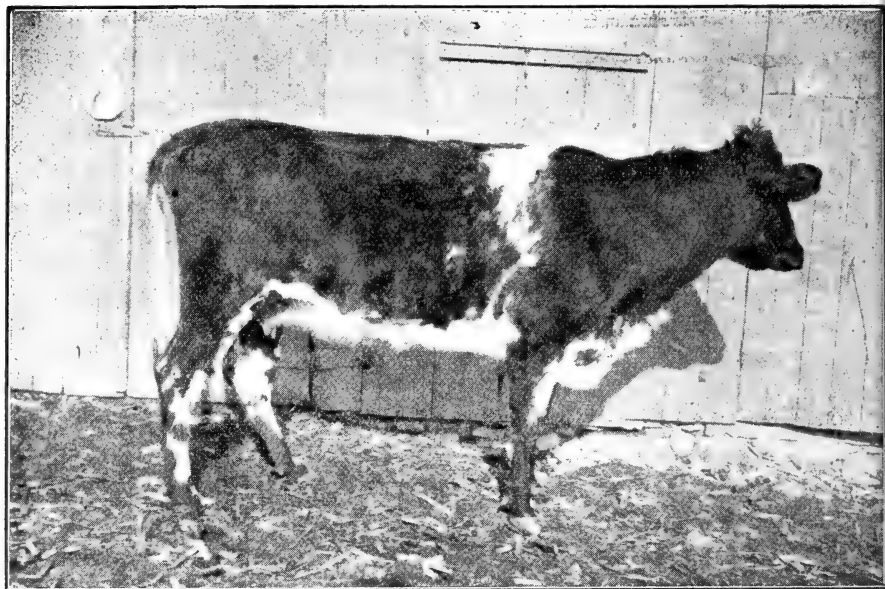
The value of the skim milk, the value of the calf, and the value of the manure produced by the cow were not credited to her, while on the other hand the cow was not debted with the amount of labor expended in her care nor the amount of feed she consumed when dry. The cow was simply credited with the amount of butter fat she produced, and charged for feed consumed when she was giving milk. The calf will usually pay for the cow's board when dry and the skim milk for the labor it takes to care for her. This method of calculation is, perhaps, a little unjust to some cows; for it is possible to have two cows yield the same amount of butter fat and one give a profit and the other a loss. If, for example, one milks ten months and the other but six months in the year to yield equal amounts of butter fat, which sometimes happens, one cow is charged with ten months' feed and the other with only six months.'

Red Bird, in herd "B," and Duchess, in herd "C," are examples of this kind. Red Bird milked ten months and charged \$1.28 for her board, and Duchess milked six months and gave a profit of \$9.16, and each yielded the same amount of butter fat.

The rations for the cows were not weighed each day. A number of dishes of meal was weighed in order to get the average amount of feed that the measure held and the number of dishes that each cow received a day was recorded. Cut and shredded corn stover and ensilage were estimated in the same manner. The hay was also weighed at different times.

#### Report of Herd "A."

Herd "A" was composed of natives, grade Shorthorns, grade Jerseys, and grade Holsteins. The average weight of each cow was 1,000 pounds. The herd was not bred for dairy purposes. Moreover, they neither showed dairy form nor capabilities of giving large flows of milk, nor producing large amounts of butter fat. Nearly every cow showed some signs of disorder. They were not in a thrifty condition. A number of



Cut 2.—Cow No. 6, Herd A, Gave in One Year 1,838 lbs. Milk;  
Average Test, 4.43 Per Cent; 95 lbs. Butter.

them aborted during the year, while others failed to get with calf and were sold. Some of them were disposed of so early in the test that their records are not calculated with the rest of the herd.

There were ten cows kept in this herd whose milk was not weighed or tested. It is unfortunate that the owner could not see the importance of weighing and testing each one of these cows, but the average amount of milk and butter fat that each of the untested cows produced for the year will be given, for a record of the amount of milk and butter fat that was sold from all the cows was kept.

The herd did not yield the amount of milk and butter fat that it should for the amount of grain consumed. While the owner did not keep an accurate enough account of the grain and roughage each cow ate to be reported upon, he fed a ration to his cows that was largely made up of

corn and other foods rich in carbohydrates and containing a small per cent of protein. The cows received a small allowance of bran with the corn meal from October 1 to January 1. During the months of January and February, to the cows giving the largest flows of milk, was given the following:

#### Ration 1.

Food stuffs	Lb.	Dry matter	Protein.	Carbohydrates	Fat	Cost
Corn meal .....	10	8.91	.790	6.670	.430	10c
Silage .....	35	7.31	.315	3.955	.245	3.5c
Timothy hay .....	10	8.68	.280	4.340	.140	5c
Total nutrients .....		24.90	1.385	14.965	.815	18.5c

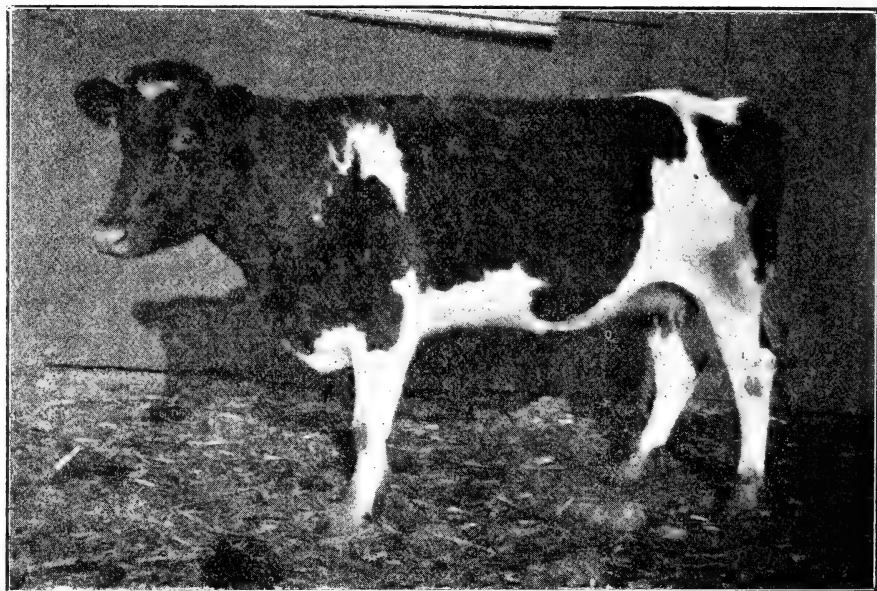
The ration was altogether too rich in carbohydrates and contained a very low per cent of protein. If this farmer had sold more of his corn and brought some mill feed he would, with less expense, have improved the ration. For example, a ton of corn meal would at this time have paid for more than a ton of grano-gluten. If a ration were made from five pounds of grano-gluten and three pounds of corn meal with the same amount and kind of roughage as contained in the above, the ration would be far better and cheaper. Such a ration would contain the following nutrients:

#### Ration 2.

Food Stuffs	Lb.	Dry matter	Protein	Carbohydrates	Fat	Cost
Grano-gluten .....	5	4.71	1.335	1.940	.010	4.5c
Corn meal .....	3	2.67	.237	2.001	.129	3c
Silage .....	35	7.31	.315	3.955	.245	3.5c
Timothy hay .....	10	8.68	.280	4.340	.140	5c
Total nutrients .....		23.38	2.167	12.236	1.134	16.0c

A number of the cows' udders became feverish and hard during the time that they were being fed so much corn. Four of them were giving milk from only three teats. It seems that excessive corn feeding must have had something to do with the general unsatisfactory condition of the herd, especially in the months of January and February, and perhaps the

cause of four of them losing the use of one-quarter of their udders. The rye and corn meal were mixed equal parts by weight, and about eight pounds of the mixture, together with timothy hay and corn silage, was the ration they received until May 1, when ground oats was substituted in the place of rye. The cows were turned out to pasture about May 25, but were given a small allowance of silage to July 1. From this time on to the completion of the year's work they received nothing, but grass. The ration which the cows received from March 1 to May 1 was somewhat better than the ration fed in January and February, but it could have been much improved with feed. The ration for fresh cows was about as follows:

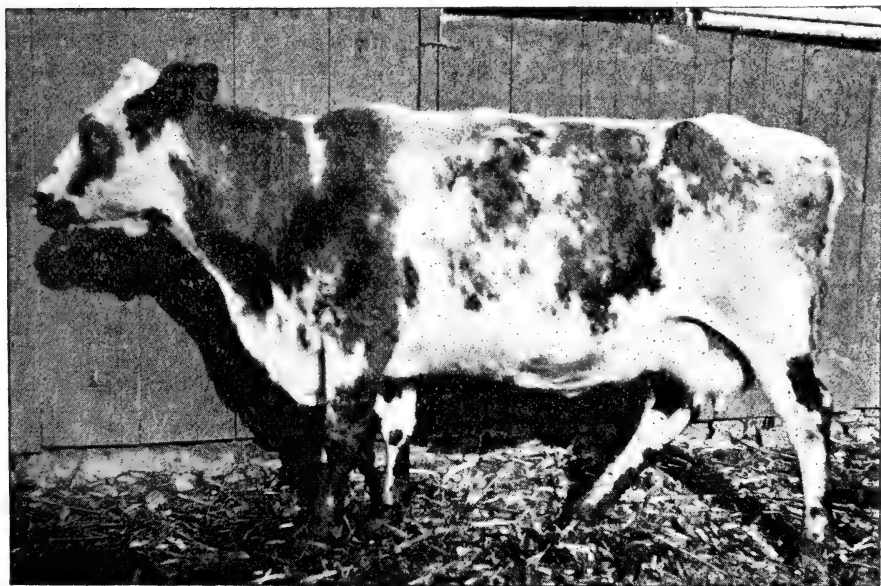


Cut 3.—Cow No. 10, Herd A, Gave in One Year 3,833 lbs. Milk;  
Average Test, 3.37 Per Cent; 150 lbs. Butter.

## Ration 3.

Food Stuffs	Lb.	Dry matter	Protein	Carbohydrates	Fat	Cost
Rye .....	4	3.54	.396	2.704	.044	4.0c
Crushed corn and cob meal .....	4	3.40	.176	2.400	.116	4.0c
Silage .....	35	7.31	.315	3.955	.245	3.5c
Timothy hay .....	7	6.08	.196	3.038	.098	3.5c
Total nutrients .....		20.33	1.033	12.097	.503	15.0c

It will be noticed that this ration which contains but 1,083 pounds of protein costs nearly as much as Ration 2, which contains 2,167 pounds of protein. It readily shows that by exchanging some of the home grown grain for mill stuff the ration could not only have been made better but



Cut 4.—Cow No. 15, Herd A, Gave in One Year 6,145 lbs. Milk;  
Average Test, 3.63 Per Cent; 260 lbs. Butter; Net Profit, \$18.40.

actually cheaper. It can be said that the cows in this herd did a very ordinary year's work, but considering the individuality of each animal in the herd, the general condition of their health, together with unskillful feeding, it is not at all surprising that the results are not better.

**Yearly Record of Best and Poorest Cow in Herd "A," and Average for Entire Herd.**

	Milk, lb.	Fat, per cent	Fat, lb.	Butter lb.
Best cow, No. 15 .....	6,145	3.63	223	260
Poorest cow, No. 37.....	1,482	3.97	58	68
Average record of cows tested.....	3,970	3.55	141	164
Average record of entire herd.....	3,361	3.55	119	139

It was found that the average cow must produce about 140 pounds of butter fat last year to pay for her board, since the average price for butter fat, when sold to the creameries, was twenty-two cents. Calculating the results upon that basis, the cows that were tested yielded a profit of twenty-three cents. To ascertain the amount of product yielded by each of the untested cows in the herd for the year, it was necessary to subtract the amount of milk and butter fat yielded by the eighteen cows that were tested from the total amount of milk and butter fat that was sold from this dairy. In this calculation a liberal amount of milk was estimated for house use and for feeding of calves.

Total amount of milk sold from Farm "A" .....	97,720 lbs.
Total amount of milk yielded by tested cows .....	76,060 lbs.
Total amount of milk yielded by the ten untested cows.....	21,660 lbs.
The average amount of milk yielded by each untested cow.....	2,166 lbs.
Total amount of butter fat sold from farm A.....	3,554 lbs.
Total amount of butter yielded by tested cows .....	2,751 lbs.
Total amount of butter yielded by ten untested cows.....	803 lbs.
The average amount of butter fat yielded by each cow untested.	80 lbs.

Calculating for the whole herd, and estimating that it takes 140 pounds of butter fat to pay for a cow's board, there is a loss of \$4.54 a cow, or each cow should have produced 20.64 pounds more butter fat to have paid for her keep.



The best cow in this herd gave a profit of \$18.40, while the poorest was kept at an actual loss of \$17.83.

Table 3.—Record of each cow in Herd "A" for one year.

Group 1.—Cows Yielding Less than 100 lbs. of Butter Fat.

No. of cow	Age, yrs.	Breed	Date of calving	Milk lb.	Fat per cent	Fat lb.	Lbs. of butter	Days in milk
37	12	Grade Jersey .....	11- 8-01	1482*	3.97	58	68	147
6	3	Native .....	5-29-02	1838	4.43	81	94	210
25	8	Native .....	2-13-02	2470	3.87	95	111	210

Group 2.—Cows Yielding Less than 140 lbs. of Butter Fat.

1	4	Grade Shorthorn .....	10-25-02	3176	3.45	109	128	196
31	10	Grade Shorthorn .....	1-17-02	3535	3.18	112	131	245
8	3	Native .....	9- 6-01	2740	4.16	114	133	259
10	4	Native .....	3- 5-02	3833	3.37	129	150	245
34	10	Grade Shorthorn, Abr....	12- 5-01	4474	2.97	133	155	294
46	3	Native .....	1- 8-02	3766	3.67	138	161	259

Group 3.—Cows Yielding Less than 175 lbs. of Butter Fat.

33	10	Grade Holstein .....	4- 9-02	3550	3.94	140	163	210
30	9	Native, Abr. ....	9-29-02	4306	3.55	153	178	299
		Native, Clv. ....	12-18-01					
29		Native, Abr. ....	3-21-02	3916	4.00	156	183	210
4	3	Native .....	4-13-02	3651	4.31	157	183	365
44	4	Native .....	11-16-01	5082	3.15	160	186	294

Group 4.—Cows Yielding Less than 225 lbs. of Butter Fat.

18	4	Grade Holstein .....	2-25-02	4895	3.87	198	221	290
2	4	Grade Holstein .....	10-30-01	6824	2.80	191	223	308
16	9	Grade Holstein .....	1- 4-01	5776	3.33	192	224	308
15	9	Grade P. S. H. ....	11- 4-01	6154	3.63	223	260	294

\* The tenth's place in the "milk" column and the tenth's and hundredth's places in the "butter fat" columns have been eliminated for the convenience of the reader. The average "percent fat," the average production, and the profit or loss of the herd, however, were figured before the elimination. This method not only applies to herd "A" but to all the herds tested.

## The Report of Herd "B."

This herd was composed largely of sommon native and grade Holstein cows. There were a number of fairly good dairy cows in the herd and a number of promising heifers. The cows weighed an average, about 1,050 pounds. The general health of the herd was good. A few of the cows aborted during the year and some of them had caked udders. A few of them were sold on this account. A number of them were disposed of so early in the test that that their records are not calculated with the rest of the herd, but are given separately. On the whole it can be said that the cows received good care and were fairly well fed throughout the year.

The cows were fed from October 1 to November 1, some ear, corn and stalks and pasture. During the months of November and December the cows received the following:

## Ration 4.

Food Stuffs	Lb.	Dry matter	Pro- tein	Carbohy- drates.	Fat	Cost
Bran .....	6	5.31	.774	2.406	.204	5.4c
Corn meal .....	6	5.35	.474	4.002	.258	6.0c
Millet hay .....	8	7.04	.256	3.880	.080	4.0c
Corn stover .....	10	5.95	.170	3.240	.070	2.0c
Total nutrients .....		23.65	1.674	13.528	.612	17.4c

This ration would have been considered better if two pounds of oil meal or gluten meal had been substituted for three pounds of corn meal and would have cost no more.

During the months of January and February the fresh cows received seven pounds of bran, four pounds of corn meal, oat straw, and corn stover ad libitum.

In March and April they received a ration about as follows:

## Ration 5.

Food stuffs.	Lb.	Dry matter.	Pro- tein.	Carbohy- drates.	Fat.	Cost.
Bran .....	6	5.31	.774	2.406	.204	5.4c
Gluten feed .....	3	2.70	.699	1.521	.081	3.3c
Clover hay .....	5	4.23	.340	1.790	.085	2.5c
Corn stover .....	8	4.76	.136	2.592	.056	1.6c
Total nutrients .....		17.00	1.949	8.309	.426	12.8c
Oat straw, ad libitum.						

This is a balanced ration and contains enough nutrients for cows giving large flows of milk. If some succulent food, such as roots or silage, had been added, it would have been still better.

In May, the fresh cows or the ones giving the most milk, received the following:

#### Ration 6.

Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy- drates.	Fat.	Cost.
Shorts .....	7	6.17	.854	3.50	.266	6.3c
Gluten feed .....	3	2.70	.699	1.521	.081	3.3c
Clover hay .....	5	4.23	.340	1.790	.085	2.5c
Millet hay .....	8	7.04	.256	3.880	.080	4.0c
Total nutrients .....		20.14	2.149	10.691	.512	16.1c

This is another very good ration as it supplies enough nutriment for a cow producing 350 pounds of butter fat a year. Each cow in the herd during the rest of the year received two pounds of shorts a day, besides plenty of blue grass pasture.

#### Yearly Record of Best and Poorest Cow in Herd "B," and Average for Entire Herd.

	Milk, lb.	Fat, per cent	Fat, lb.	Butter lb.
Best cow, Hartwell No. 2. ....	6,197	3.99	2.47	288
Poorest cow, Brindle No. 1 .....	3,731	2.88	107	125
Average record of entire herd.....	5,360	3.52	188	220

Spotty No. 1 charged to produce 100 pounds of milk, 40.7 cents and 12.6 cents for one pound of butter fat.

Red Bird charged to produce 100 pounds of milk, 70.9 cents, and 23.2 cents for one pound of butter fat..

The average cost of this herd to produce 100 pounds of milk was 57.0 cents and 16.1 cents to make one pound of butter fat.

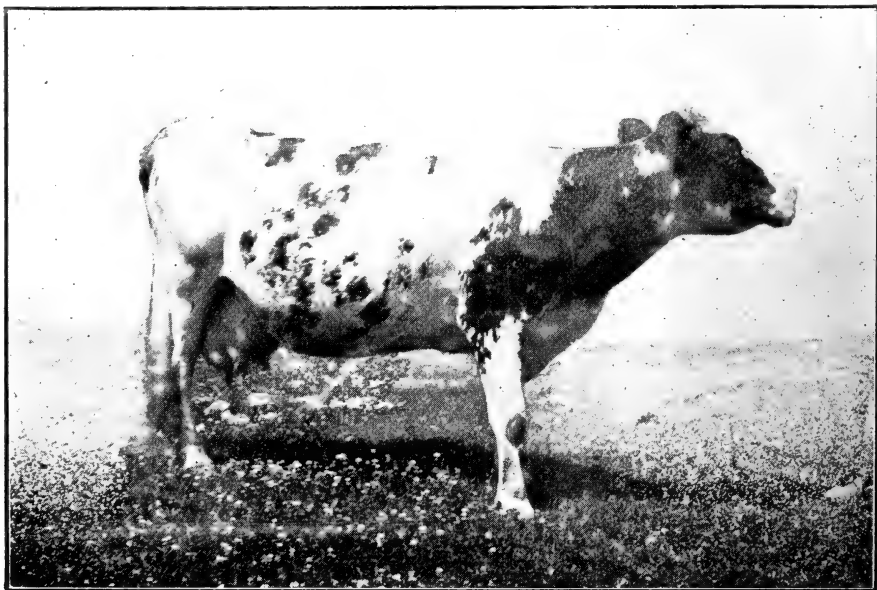
Spotty No. 1 gave a profit of \$25.32 and Red Bird charged \$1.28 for her board..

The average profit of each cow was \$12.12.

The average price of grain and roughage from September 1, 1901, to September 1, 1902, was about as follows:

Bran .....	\$18.00 per ton.	Oil meal .....	\$28.00 per ton.
Shorts .....	18.00 "	Clover hay .....	10.00 "
Corn meal .....	20.00 "	Timothy hay .....	10.00 "
Corn cob meal .....	20.00 "	Millet hay .....	10.00 "
Grano-gluten .....	18.00 "	Corn stover .....	4.00 "
Gluten meal .....	28.00 "	Corn silage .....	2.00 "
Gluten feed .....	22.00 "	Pasture.....	\$1.00 per month.

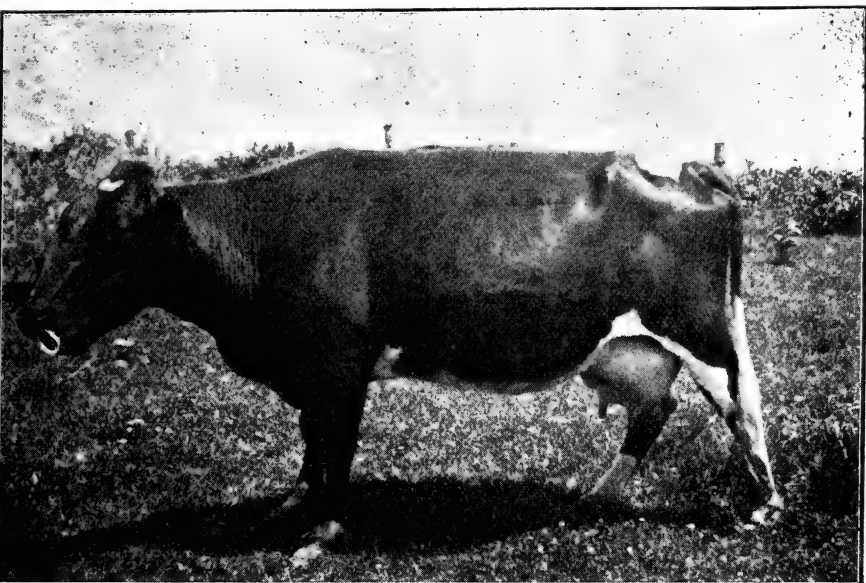
The price of grain is based upon purchase price in the city market and the price of roughage is based upon the purchase price at the farm. When the cow is charged the above prices for farm products the farmer receives a profit on his land and the profit which the cow gives him is over and above what he could have received from his products if he had sold them upon the market, and, moreover, the cows are often fed that which is not marketable. Take corn stover, for example, what would it be worth if it was not for the live stock kept upon the farms?



Cut 5. Spotty No. 1, Herd B, Gave in One Year 7,711 lbs. Milk; Average Test, 3.20%; 288 lbs. Butter; Net Profit, \$25.32.

The average prices of butter fat when sold to the creameries for the different months, were as follows:

September, 1901 .....	19c	April, 1902 .....	26c
October, 1901 .....	19c	May, 1902 .....	22c
November, 1901 .....	20c	June, 1902 .....	21c
December, 1901 .....	22c	July, 1902 .....	20.5c
January, 1902 .....	24c	August, 1902 .....	19c
February, 1902 .....	28c	September, 1902 .....	20.5c
March, 1902 .....	28c	October, 1902 .....	23c



Cut. 6. Red Bird, Herd B, Gave in One Year 4,974 lbs. Milk; Average Test, 3.04%; 176 lbs. Butter; Net Loss, \$1.28.

Table Showing Profit or Loss for each Cow in Herd "B" for one year.

Group 1. Kept at a Loss.							
Name of cow.	Milk lb.	Fat, %	Fat, lb.	Lbs. of butter.	Gross returns.	Cost of feed.	Profit or less
Red Bird .....	4,974	3.04	151	176	\$33.99	\$35.27	\$1.28
Belle .....	4,412	3.38	149	174	33.25	34.30	1.04
Brindle No 1 .....	3,731	2.88	107	125	25.41	26.41	1.00
Group 2. Kept at a small Profit.							
Alice .....	4,231	3.97	168	196	\$38.61	\$34.30	\$4.31
Little Lamie .....	3,956	3.05	120	140	27.32	21.95	5.37
Harry Cow .....	4,891	3.14	153	179	35.00	27.93	7.07
Sleepy Eye .....	4,130	4.20	176	205	40.53	31.67	8.86
Group 3 Kept at a Fair Profit.							
Black No. 2 .....	5,474	3.53	193	225	\$44.28	\$32.91	\$11.37
Spotty No. 2 .....	6,720	3.34	224	262	50.85	38.51	12.34
Roaney .....	5,705	3.94	225	262	52.43	39.46	12.97
Dora .....	4,989	3.70	184	215	39.51	26.40	13.11
Black No. 1 .....	6,179	3.05	188	220	44.36	30.71	13.65
Group 4. Kept at a Good Profit.							
Hartwell No. 2 .....	6,197	3.99	247	288	\$55.47	\$30.49	\$24.98
Spotty No. 1.....	7,711	3.20	247	288	56.73	31.41	25.32
Bottle .....	5,450	3.66	199	232	42.79	27.37	15.42
Beauty .....	6,402	3.82	245	285	53.62	36.79	16.83
Hartwell No. 1 .....	4,421	4.20	186	217	38.24	21.10	17.14
Brindle No. 2 .....	4,683	3.43	161	187	38.52	20.85	17.67
Clara .....	6,101	3.89	237	277	54.85	35.95	18.90
Pet .....	6,793	3.10	211	246	48.60	28.18	20.42

Table 5. Record of each cow in Herd "B" for One Year.

Group 1. Cows Yielding Less than 160 lbs. of Butter Fat.							
Name of cow.	Age, yr.	Breed.	Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but- in ter. milk.
Brindle No. 1...	15	Native....	2- 2-02	3,731	2.88	107	125 203
Little Lamie ....	8	Native....	3- 1-02	3,956	3.05	120	140 275
Belle .....	3	Gr. Holst..	11-10-01	4,412	3.38	149	174 290
Red Bird .....	6	Gr. Holst..	9-30-01	4,974	3.04	151	176 300
Harry Cow .....	10	Gr. Holst..	2- 3-02	4,891	3.14	153	179 240

Table 4.—Continued.

**Group 2. Cows yielding Less than 200 Pounds of Butter Fat.**

Name of cow.	Age, yr.	Breed.	Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but- in ter. milk.
Brindle No. 2 ...	4	Native....	.....	4,683	3.43	161	187 210
Alice .....	3	Gr. Holst..	11-13-01	4,231	3.97	168	196 287
Sleepy Eye .....	5	Native....	12-25-01	4,190	4.20	176	205 320
Dora .....	6	Gr. Holst..	3-21-02	4,989	3.70	184	215 310
Hartwell No. 1..	8	Native....	5-27-02	4,421	4.20	186	217 270
Black No. 1.....	8	Gr. Holst..	1-28-02	6,179	3.05	188	220 275
Black No. 2. ...	4	Gr. Holst..	2-21-02	5,474	3.52	193	225 340
Bottle .....	5	Gr. Holst..	4-11-02	5,450	3.66	199	232 300

**Group 3. Cows Yielding Less than 250 lbs. of Butter Fat.**

Pet .....	5	Gr. Holst..	2-12-02	6,793	3.10	211	246 260
Spotty No. 2 ...	8	Native....	9-24-01	6,720	3.34	224	262 300
Roaney .....	7	Native....	11- 7-01	5,705	3.94	225	262 305
Clara .....	5	Gr. Holst..	10- 1-01	6,101	3.89	237	277 300
Beauty .....	4	Native....	10- 5-01	6,402	3.82	245	285 305
			7-31-02				
Spotty No. 1 ...	12	Native....	2-21-02	7,711	3.20	247	288 280
Hartwell No. 2 .	12	Native....	3- 1-02	6,197	3.99	247	288 267

**Report of Herd 'C.'**

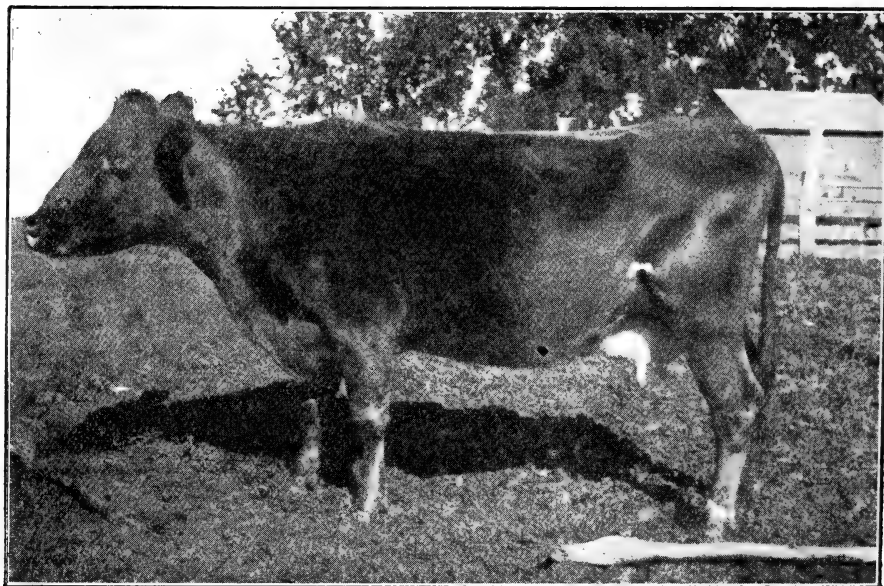
This herd was composed of natives, grade Shorthorns, grade Holsteins, one Red Poll and two grade Jerseys. The average weight of the cows was about 1,050 pounds and they were in good health during the whole year. There were no abortions or caked udders during the time the test was made. A number of the cows were sold early in the test because of their rapid falling off in milk flow when about three months along in the period of lactation. This is a very common fault with a great many cows kept in the dairy, and it is not noticed by the owners as much as it should be. They remember the cow when she gave a full pail of milk. The herd received good care during the year and was kept in a warm barn during the winter where it received a fairly good ration. The frash cows in October to November were fed daily about three pounds of bran, shock corn and pasture. From November 15 to January 1 the ration consisted of the following feeds: Bran, 5 pounds; corn meal,

three pounds; corn stover, ad libitum. If the farmer could have given his cows ten pounds of alfalfa or clover hay and less corn stover it would have been a considerably better ration.

In January and February a little better ration was fed. It was about as follows:

**Ration 7.**

Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy- drates.	Fat.	Cost.
Bran .....	5	4.42	.645	2.005	.170	4.5c
Corn meal .....	5	4.45	.395	3.335	.215	5.0c
Gluten feed .....	1	.90	.233	.507	.027	1.1c
Timothy hay .....	5	4.24	.140	2.170	.070	2.5c
Corn stover .....	12	7.14	.204	3.888	.084	2.4c
Total nutrients .....		21.25	1.617	11.905	.566	15.5c



Cut 7. Crazy, Herd C, Gave in One Year 6,954 lbs. Milk; Average Test 4.23 per cent; 334 lbs. Butter; Net Profit, \$31.55.



This ration would have been still better if the corn meal had been reduced two pounds and gluten feed increased to four pounds. During the months of March, April and May, to the cows giving the largest flow of milk were given the following:

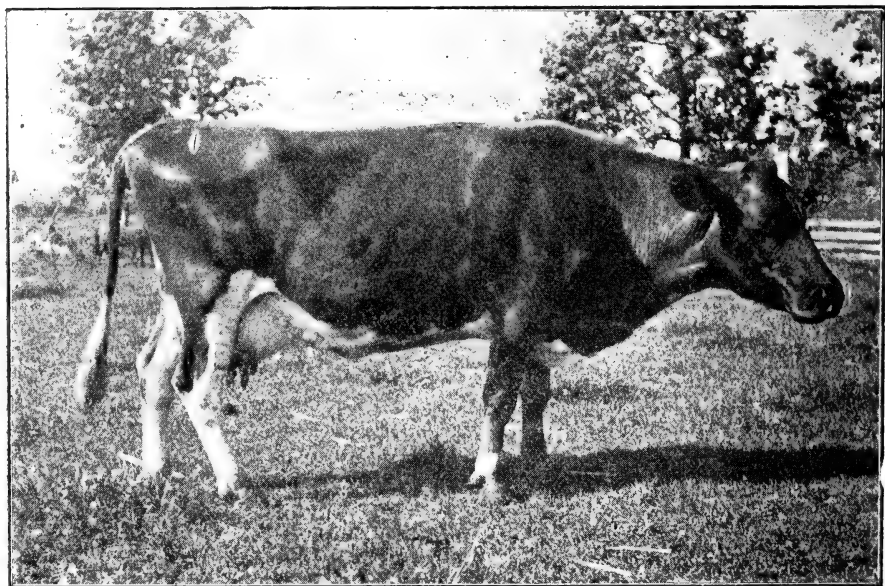
**Ration 8.**

Food stuffs.	Lb.	Dry matter.	Protein.	Carbohydrates.	Fat.	Cost.
Bran .....	5	4.42	.645	2.005	.170	4.5c
Gluten feed .....	2	1.80	.466	1.014	.054	2.2c
Oil meal .....	1	.91	.293	.327	.078	1.4c
Timothy hay .....	15	13.02	.420	6.510	.210	7.5c
Total nutrients .....		20.15	1.824	9.856	.512	15.6c



Cut 8. Duchess. Herd C. Gave in One Year 4,229 lbs. Milk; Average Test, 4:58 per cent; 117 lbs. Butter; Net Profit, \$9.16.

The cows were turned out to pasture about May 20, and as soon as grass was plentiful they received no grain during the rest of the test. They, however, received some forage in connection with the pasture. Green peas and oats were fed in July, and in August green sorghum. It can be said that the herd was well cared for the whole year, and, moreover, every cow was fed as near as possible according to the amount of milk and butter fat that she was yielding. It must be borne in mind that the rations given above were fed to cows that were producing the most milk and butter fat and not to the strippers.



Cut 9. Jersey Herd C, Gave in One Year 5,498 lbs. Milk; Average Test, 4.48 per cent; 287 lbs. Butter; Net Profit, \$34.77.

**Yearly Record of Best and Poorest Cow in Herd "C," and Average for  
Entire Herd**

	Milk, lb.	Fat, %	Fat, lb.	Butter, lb.
Best cow, Jersey .....	6,945	4.23	294	343
Poorest cow, Harrison .....	2,721	3.96	108	126
Average yield of entire herd.....	4,942	3.90	192	224

Jersey produced butter fat the cheapest. She charged 29.7 cents to produce 100 pounds of milk, and 6.6 cents to make one pound of butter fat.

Harrison charged 97.7 cents to make 100 pounds of milk, and 24.6 cents to make one pound of butter fat.

The average cost of this herd to produce 100 pounds of milk was 55.5 cents, and 14.2 cents to produce one pound of butter fat.

Jersey gave a profit of \$34.77, and Harrison charged \$1.27 for her keeping.

The average profit for each cow in the herd was \$16.22.

**Table 6.—Showing Profit or Loss for Each Cow in Herd "C" for One Year**

**Group 1.—Kept at a Loss.**

Name of cow.	Milk lb.	Fat, %	Fat, Lbs.	Lbs. of butter.	Gross returns.	Cost of feed.	Profit or loss
Harrison .....	2,721	3.96	108	126	\$25.34	\$26.61	\$1.27
Ella .....	3,519	3.64	128	149	29.12	30.98	1.86

**Group 2.—Kept at a Small Profit.**

White Face .....	3,865	3.56	137	160	\$31.69	\$31.30	\$ .39
Millie .....	4,118	3.83	157	184	36.68	28.29	8.39
Duchess .....	4,223	3.59	151	177	37.47	28.31	9.16

**Group 3.—Kept at a Fair Profit.**

Victorie .....	2,949	4.34	129	151	\$26.28	\$15.81	\$10.47
Little Brownie .....	5,121	3.75	192	224	45.18	32.60	12.58
Lady .....	5,015	3.94	197	230	42.71	27.72	14.99

Table 6.—Continued.

## Group 4.—Kept at a Very Fair Profit.

No. of cow.	Milk lb.	Fat, %	Fat, Lbs. of		Gross	Cost of	Profit
			lb.	butter.	returns.	feed	or loss
Pet .....	5.590	3.43	191	223	\$45.15	\$25.66	\$19.49
Old Line Back .....	5.926	3.55	210	245	50.34	28.47	21.87
Queen .....	4.857	3.73	181	211	38.90	21.61	17.29
Black Hawk .....	6.500	3.99	259	303	58.52	34.88	23.64
Babe .....	5.186	4.68	242	283	54.78	33.60	21.18

## Group 5.—Kept at a Good Profit.

Stubborness .....	5.924	3.50	207	242	\$45.19	\$20.39	\$24.80
Roaney .....	6.013	3.97	238	278	57.46	29.00	28.46
Crazy .....	6.945	4.23	294	343	66.77	35.22	31.55
Jersey .....	5.498	4.48	246	287	51.15	16.38	34.77

Table 7.—Record of Each Cow in Herd "C" for One Year.

## Group 1.—Cows Yielding Less than 160 lbs. of Buter Fat.

Name of cow.	Age, yr.	Breed.	Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but- in ter. milk.
Harrison .....	2	Gr. Holst..	7- 6-01	2,721	3.96	108	126 246
Ella .....	2	Gr. Holst..	9-25-01	3,519	3.64	128	149 295
Victoria .....	4	Gr. Holst..	6- 5-02	2,979	4.34	129	151 214
White Face ...	.2	Gr. Holst..	9-15-01	3,865	3.56	137	160 290
Duchess .....	8	Native....	1- 2-02	4,229	3.59	151	177 197

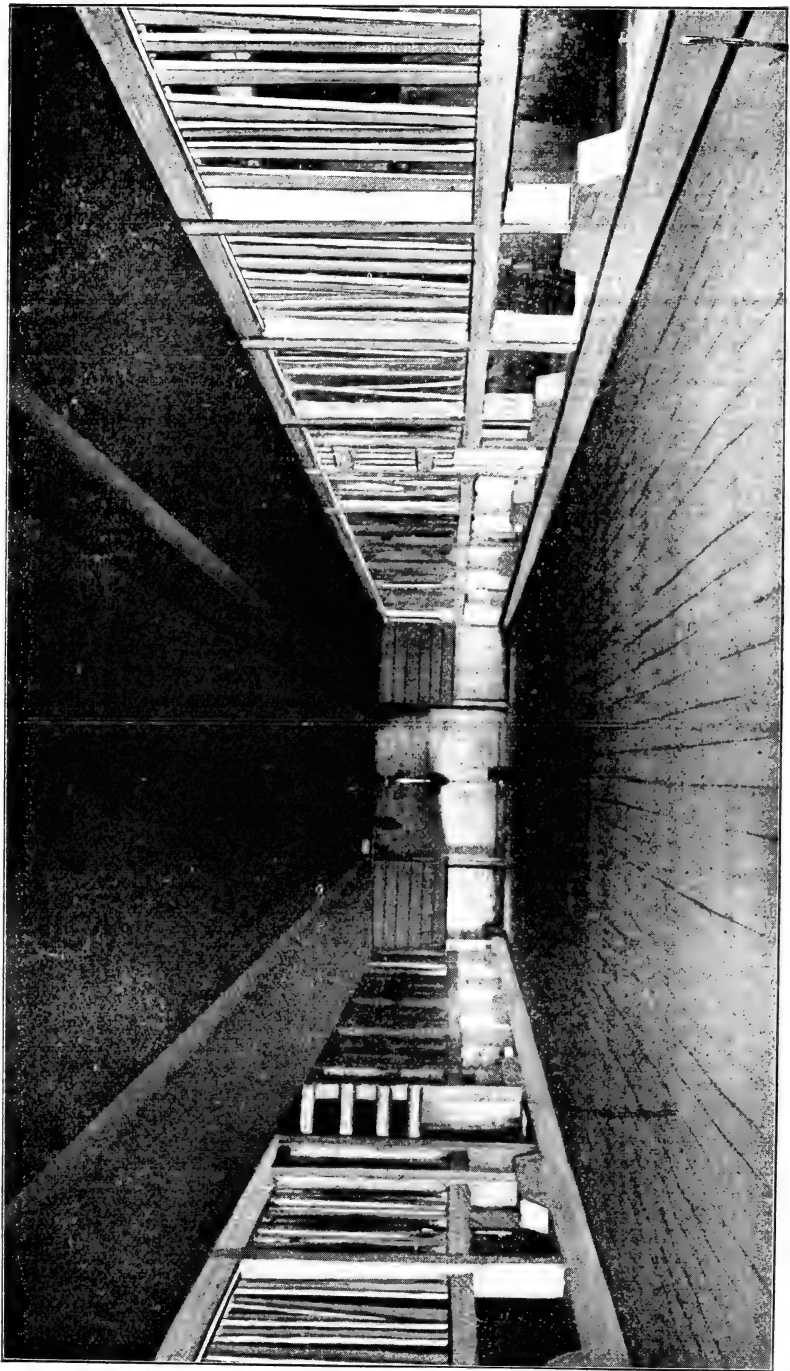
## Group 2.—Cows Yielding Less than 200 lbs. of Butter Fat.

Millie .....	2	Gr. Holst..	10-20-01	4,118	3.83	157	184 330
Queen .....	4	Gr. S. H...	3-28-02	4,857	3.73	181	211 260
Pet .....		Gr. Holst..	11-26-01	5,590	3.43	191	223 305
Little Brownie.	8	Native....	10- 3-01	5,121	3.75	192	224 245
Lady .....	9	Gr. S. H...	3-28-02	5,015	3.94	197	230 303

## Group 3.—Cows Yielding Less than 300 lbs. of Butter Fat.

Stubborness ...	9	Gr. Holst..	3-29-02	5,924	3.50	207	242 246
Old Line Back.	12	Native....	12 20-02	5,926	3.55	210	245 250
Roaney .....		Gr. S. H...	1- 5-02	6,013	3.97	238	278 245
Jersey .....	9	Gr. Jer....	1- 3-02	5,498	4.48	246	287 275
Babe .....	6	Gr. Jer....	10- 3-01	5,186	4.68	242	283 365
Crazy .....	10	Gr. Red P..	10- 4-01	6,945	4.23	294	343 335
Black Hawk ..	4	Gr. Holst..	9-26-01	6,500	3.99	259	303 335

A SANITARY COW STABLE—FLOOR KEPT CLEAN, CEILED OVERHEAD, AND WHOLE INTERIOR WHITEWASHED.



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## Report of Herd "D."

The cows in this herd consist of full blood Jerseys, grade Jerseys, full blood Holsteins, grade Holsteins, natives and grade Shorthorns. There were sixty cows in the herd when the test began and forty-seven of them remained through the year. Thirteen of the cows were sold during the time the test was being made for they were found to be inferior and unprofitable animals. The herd contained a great many very fine dairy cows and they made some very good records. The cows were in a good condition during the whole year and were kept in a scrupulously clean and well ventilated barn which was scrubbed once a day and white washed twice a year. The sanitary condition was nearly perfect. The cows were not only well cared for, but they received well balanced rations during the entire year. The results of the herd readily show the importance of taking good care of dairy cows and of feeding them well. Some of the rations that the herd received at different times during the year show clearly how well these cows were fed.

From September 1 to the middle of October, to the cows giving the largest flow of milk, the rations consisted of six pounds of grano-gluten and all the green corn that they could eat up clean. From October 15 to December 7, the ration to the best milkers was about as follows:

## Ration 9.

Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy-drates.	Fat.	Cost.
Grano-Gluten .....	5	4.71	1.335	1.940	.62	4.5c
Corn meal .....	3	2.67	.237	2.001	.129	3.0c
Corn silage .....	45	9.40	.405	5.085	.315	4.5c
Timothy hay .....	5	4.34	.140	2.170	.070	2.5c
Total nutrients .....		21.12	2.117	11.196	1.134	14.5c

The ration fed from December 7 to February 1 was as follows:

## Ration 10.

Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy-drates.	Fat.	Cost.
Shorts .....	3	2.65	.366	1.50	.114	2.7c
Corn meal .....	2	1.78	.158	1.334	.086	2.0c
Gluten meal .....	3	2.64	.963	1.236	.075	4.2c
Corn silage .....	45	9.40	.405	5.085	.315	4.5c
Hay .....	5	4.34	.140	2.170	.070	2.5c
Total nutrients .....		20.81	2.032	11.325	.660	15.9c

The cows seemed to do better when fed grano-gluten and corn meal than when they were fed shorts, corn meal and gluten meal.

The ration from February 1 to March 15 was five pounds of grano-gluten, three pounds of corn meal, and fifty pounds of silage and timothy hay. From this time on until the cows were turned out to grass, they received about the following:

Ration 11.

Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy- drates.	Fat.	Cost
Grano-gluten .....	7	6.60	1.869	2.716	.868	6.3c
Corn meal .....	3	2.67	.237	2.001	.129	3.0c
Silage .....	60	12.54	.540	6.780	.420	6.0c
Total nutrients .....		21.81	2.646	11.497	1.417	15.3c

It will be noticed that this ration contains no hay, corn silage being the only roughage that the cows received. The cows did very well on this ration and when they were turned out to pasture, which was about June 1, they were in good condition. In June the cows received about four pounds of grano-gluten a day, besides a grass pasture.

In July and August they received nothing but pasture grass. The above rations apply more to the general feeding of the best milkers in the herd, the strippers and poor milkers getting according to the amount of milk they were producing.

It should be observed that the rations given to the cows during the year did not contain a large amount of grain, but each one contained a liberal amount of nutrients for cows that were giving a large flow of milk and yielding large amounts of butter fat. It will also be noticed that each ration contained over two pounds of protein. This can be accounted for when grano-gluten is compared with bran or oats, for it contains twice as much digestible protein. Therefore, it is not necessary to feed so many pounds of the grano-gluten as we would have to feed of bran or oats to get the same amount of digestible protein.

The above facts are mentioned so that the reader will not be misled when he compares the total amount of grain that each cow in this herd consumed with the total amount of grain consumed by each cow in some other herd. When the cows in this herd were not receiving grano-gluten they were receiving gluten meal which is a by-product of glucose refining

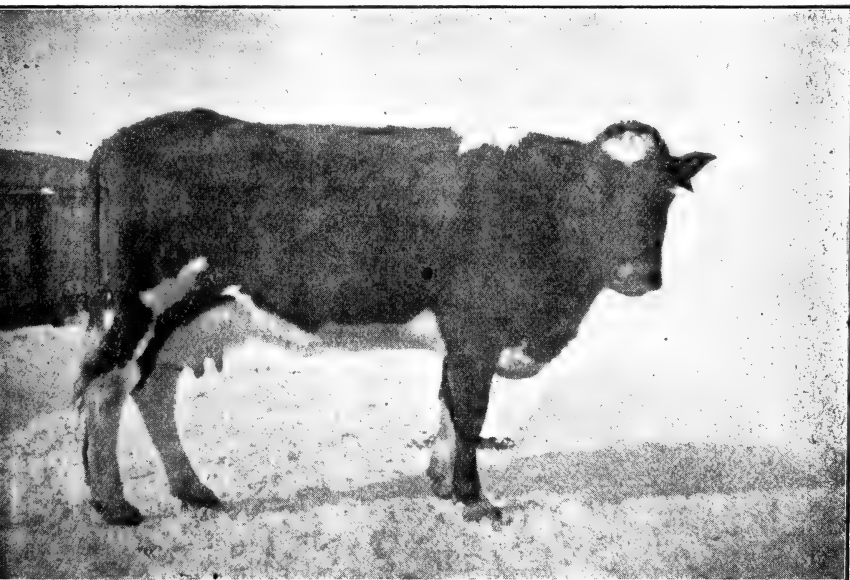


companies. This feed is also very rich in protein. It contains about thirty-two per cent of digestible protein. These facts demonstrate very clearly that it often pays farmers to sell some of their oats or corn and buy some such by products as gluten meal, gluten feed, grano-gluten, oil meal, or dried brewers' grains, etc.

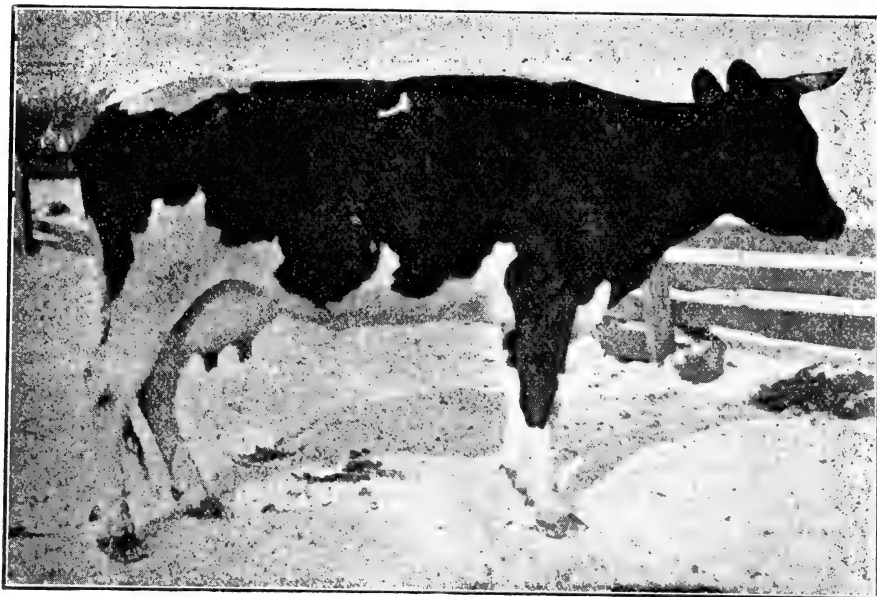
**Yearly Record of Best and Poorest Cow in Herd "D," and Average for Entire Herd.**

	Milk, lb.	Fat, %	Fat, lb.	Butter, lb.
Best cow, No. 129 .....	8,949	4.52	404	472
Poorest cow, No. 324 .....	3,364	4.06	136	159
Average record of entire herd....	5,911	4.45	263	306

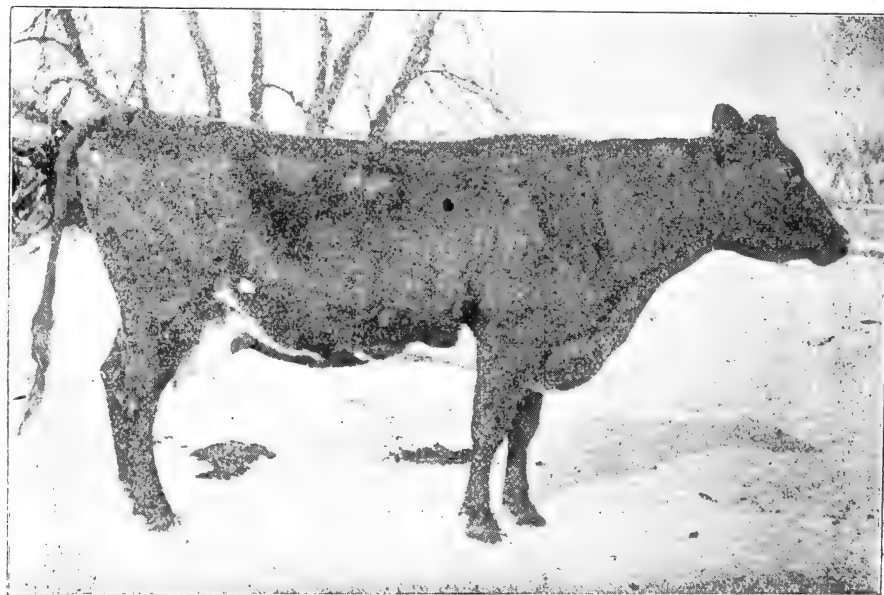
Cow No. 147 made butter fat the cheapest. She charged 7.5 cents to produce one pound of butter fat and 35.5 cents to produce 100 pounds of milk.



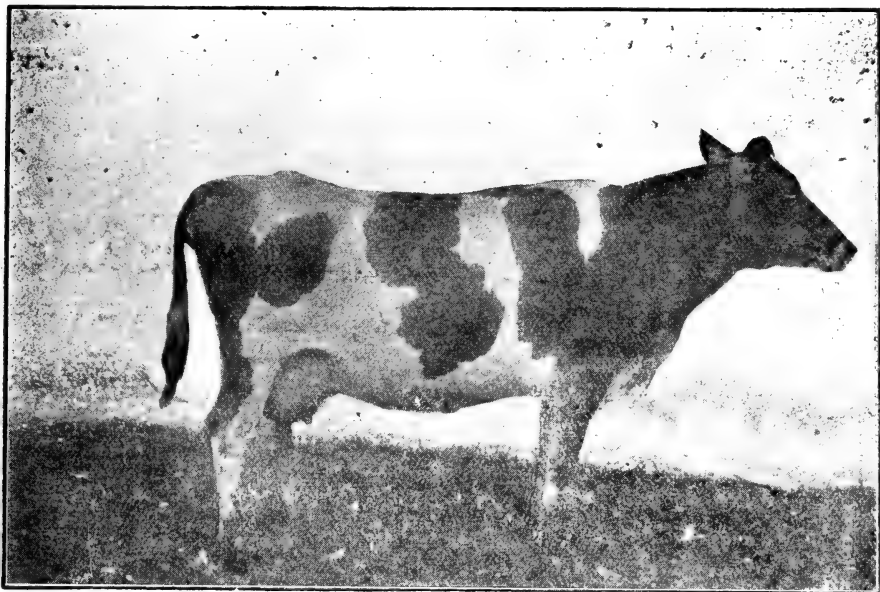
**Cut 10.—Cow No. 283, Herd D, Gave in One Year 10,151 lbs. Milk; Average Test, 3.68 %; 436 lbs. Butter; Net Profit, \$45.36.**



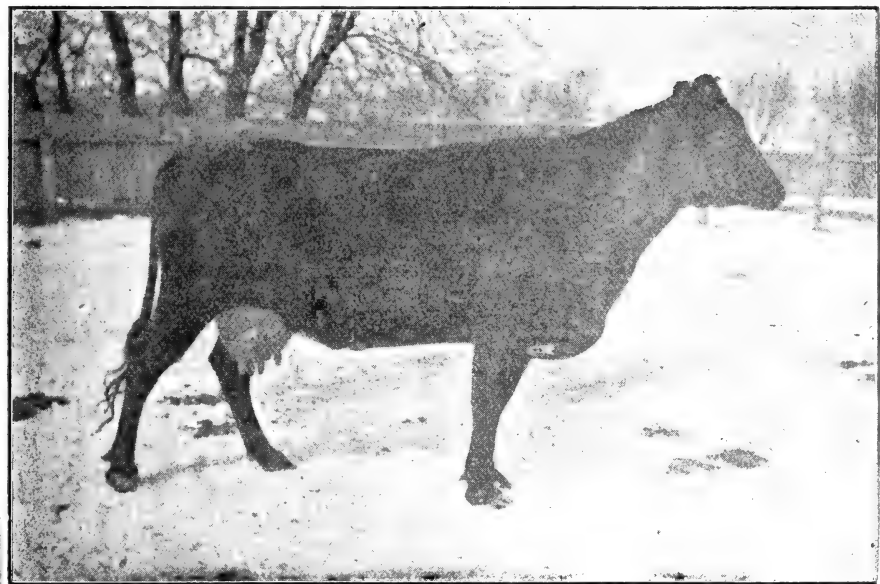
Cut 11. Cow No. 317, Herd D, Gave in One Year 10,059 lbs. Milk;  
Average Test, 3.79%; 445 lbs. Butter; Net Profit, \$48.94.



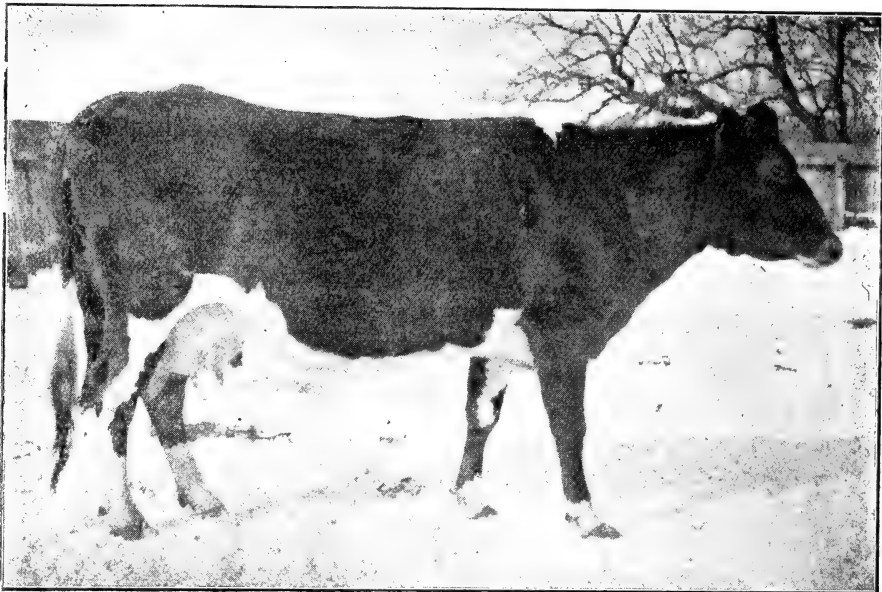
Cut 12. Cow No. 147, Herd D, Gave in One Year 7,890 lbs. Milk;  
Average Test, 4.70 %; 432 lbs. Butter; Net Profit, \$57.22.



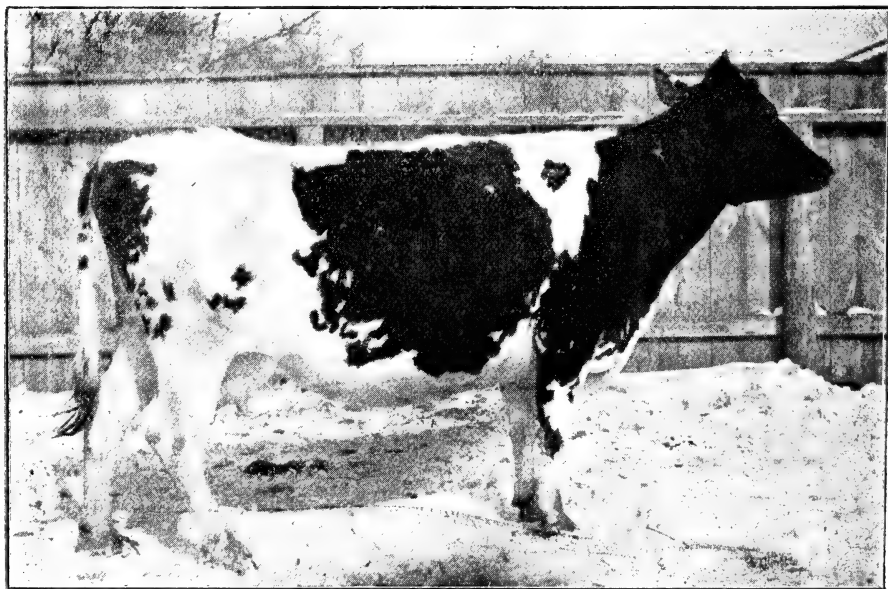
Cut. 13.—Cow No. 199, Herd D, Gave in One Year 6,132 lbs. Milk;  
Average Test, 4.75 %; 340 lbs. Butter; Net Profit, \$31.54.



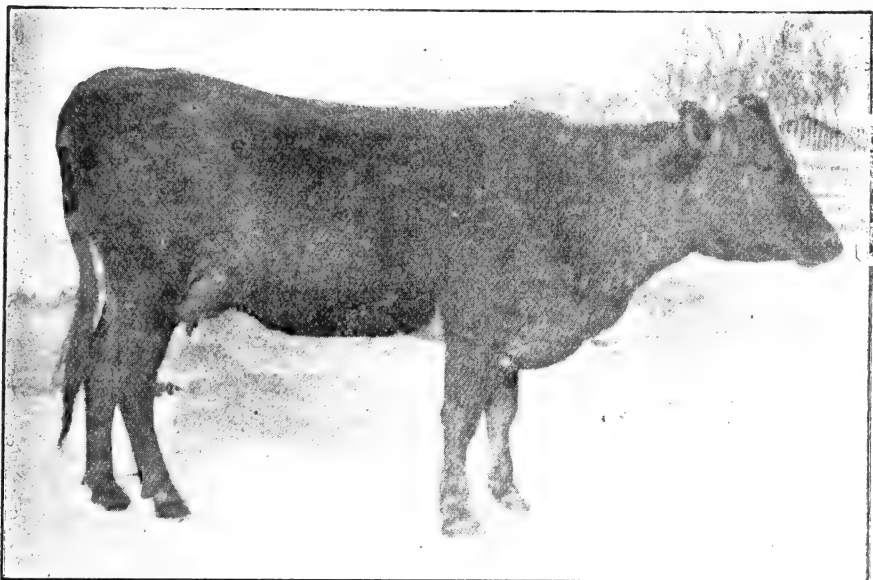
Cut. 14.—Cow No. 44, Herd D, Gave in One Year 3,399 lbs. Milk;  
Average Test, 4.58 %; 181 lbs. Butter; Net Loss, 18 Cents.



Cut 15. Cow No. 184, Herd D, With Two Quarters of Her Udder Gone,  
Gave in One Year 7,997 lbs. Milk; Average Test, 4.77 %;  
445 lb. Butter; Net Profit, \$49.42.



Cut 16. Cow No. 95, Herd D, Gave in One Year 7,615 lb. Milk;  
Average Test, 4.85%; 430 lbs. Butter; Net Profit, \$42.35.



Cut. 17. Cow No. 337, Herd D, Gave in One Year 3,443 lbs. Milk;  
Average Test, 4.46 %; 179 lbs. Butter; Net Profit, \$2.52.



Cut 18. Cow No. 263, Herd D, Gave in One Year 4,887 lbs. Milk;  
Average Test, 4.04%; 230 lbs. Butter; Net Profit, \$18.99.



Cut 19. Cow No. 40, Herd D, Gave in One Year 6,575 lbs. Milk;  
Average Test, 3.23%; 248 lbs. Butter; Net Profit, \$17.09.

Cow No. 44 charged the most to make butter fat. She charged 22.4 cents to make one pound of butter fat and \$1.03 to make 100 pounds of milk.

The average cost to produce one pound of butter fat was 12.3 cents and 54.9 cents to produce 100 pounds of milk.

Cow No. 147 gave a profit of \$57.22 and cow No. 44 charged 18 cents for her board.

The average profit for each cow in the herd was \$26.64. While the average profit is very good, it would, perhaps, have been better if the owner could have personally looked after his cows. The cows were cared for entirely by hired help.

Table 8.—Showing Profit or Loss for Each Cow in Herd "D" for One Year.

Group 1...Kept at a Loss.							
No. of cow	Milk lb.	Fat, %	Fat, lb.	Lbs. of butter.	Gross returns.	Cost of feed	Profit or loss
44	3,399	4.58	155	181	\$34.85	\$35.03	\$ .18
Group 2.—Kept at a Small Profit.							
337	3,443	4.46	153	179	\$35.29	\$32.77	\$2.52
324	3,364	4.06	136	159	33.15	29.12	4.03
308	4,617	3.83	177	206	40.17	33.80	6.37
323	4,069	4.15	169	197	40.67	33.92	6.75
Group 3.—Kept at a Fair Profit.							
22	3,187	4.35	138	161	\$29.46	\$19.07	\$10.39
227	4,389	4.40	193	225	40.47	29.22	11.25
272	5,266	3.61	190	222	44.30	32.67	11.63
310	3,777	4.99	188	220	41.86	30.00	11.86
264	4,823	4.07	196	229	46.03	33.50	12.53
99	4,700	4.72	222	259	46.76	32.16	14.60
Group 4.—Kept at a Very Fair Profit.							
138	5,449	3.99	217	253	\$49.41	\$34.09	\$15.32
40	6,575	3.23	212	248	45.83	28.74	17.09
240	5,257	4.05	213	248	50.07	32.09	17.98
325	5,446	4.30	234	273	52.73	33.94	18.79
263	4,887	4.04	197	230	41.90	22.91	18.99
336	4,796	5.00	239	279	54.11	34.88	19.23
20	4,958	4.51	223	261	51.70	32.13	19.57
13	4,462	5.26	235	274	55.03	33.88	21.15
180	5,505	4.19	230	269	50.14	28.53	21.61
326	5,285	4.79	253	295	57.64	34.07	23.57
335	5,414	4.36	236	275	56.54	32.70	23.84
Group 5.—Kept at a Good Profit.							
161	5,731	4.70	269	314	\$57.00	\$31.65	\$25.35
309	7,979	3.75	299	349	67.06	41.59	25.47
112	5,481	4.57	250	292	54.63	27.62	27.01
70	6,732	4.34	292	341	63.83	35.95	27.88
190	5,477	5.60	306	357	69.31	39.44	29.87
210	5,201	5.07	263	307	61.90	32.03	29.87
114	6,407	4.00	256	299	59.74	29.02	30.72
38	7,199	4.36	313	366	69.15	37.61	31.54
199	6,132	4.75	291	340	64.04	32.50	31.54
80	5,551	5.14	285	332	65.86	33.94	31.92
87	5,500	4.85	266	311	59.40	27.27	32.13

Table 8—Continued.  
Group 6.—Kept at a Very Good Profit.

No. of cow.	Milk lb.	Fat, %	Fat, Lbs.	Lbs. of butter.	Gross returns.	Cost of feed	Profit or loss
113 .....	5,577	4.99	278	324	\$58.01	\$24.80	\$33.21
109 .....	6,286	4.46	280	327	61.19	25.23	35.96
46 .....	6,549	4.62	302	353	71.29	35.07	36.22
247 .....	6,581	4.76	313	366	69.10	31.68	37.42
95 .....	7,615	4.85	369	430	79.30	36.45	42.85
249 .....	6,811	4.79	326	380	74.20	29.27	44.93

Group 7.—Kept at an Excellent Profit.

283 .....	10,151	3.68	374	436	\$87.13	\$41.77	\$45.36
129 .....	8,949	4.52	404	472	87.33	40.44	46.89
206 .....	7,130	4.71	336	392	78.30	31.27	47.03
262 .....	9,272	4.01	372	434	84.78	37.74	47.04
102 .....	6,501	5.46	355	414	82.20	34.88	47.32
317 .....	10,059	3.79	381	445	86.95	38.01	48.94
184 .....	7,997	4.77	382	445	83.77	34.35	49.42
147 .....	7,890	4.70	371	432	85.24	28.02	57.22

Table 9.—Record of Each Cow in Herd D for One Year.

Group 1.—Cows Producing Less Than 200 lbs. Butter Fat.

No. of cow.	Age, yr.	Breed.	Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but- in ter. milk.
324 .....	..	.....	10-15-01	3,364	4.06	136	159 230
22 .....	10	Native....	3- 7-02	3,187	4.35	138	161 225
337 .....	3	Native....	11- 1-01	3,443	4.46	153	179 304
44 .....	8	Gr. Jersey	3- 1-01	3,399	4.58	155	181 365
323 .....	..	.....	10-29-01	4,069	4.15	169	197 245
308 .....	..	.....	8-15-01	4,617	3.83	177	206 320
310 .....	4	Native....	7-21-02	3,777	4.99	188	220 330
272 .....	..	.....	8-11-02	4,389	3.61	190	222 350
227 .....	7	Gr. Holst.	5-28-02	5,266	4.40	193	225 274
264 .....	7	Native....	10- 6-01	4,823	4.07	196	229 303
263 .....	7	Gr. Holst.	4-13-02	4,887	4.04	197	230 218

Group 2.—Cows producing Less than 225 lb. of Butter Fat.

40 .....	9	Native....	3-23-02	6,575	3.23	212	248 274
240 .....	5	Gr. Holst.	12- 1-01	5,257	4.05	213	248 323
138 .....	6	Gr. S. H..	8-24-01	5,449	3.99	217	253 275
99 .....	7	Native....	5- 1-02	4,700	4.72	222	259 304
20 .....	5	Gr. S. H..	11-15-01	4,958	4.51	223	261 270



Table 9—Continued.

## Group 3.—Cows Producing Less than 275 lbs. of Butter Fat.

No. of cow.	Age, yr.	Breed.	Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but- in ter. milk.
180.....	..	.....	3-16-02	5,505	4.19	230	269 267
325.....	5	Native....	4-13-02	5,446	4.30	234	273 300
13.....	9	Jersey....	12- 1-01	4,462	5.26	235	274 302
335.....	8	Native....	10-27-02	5,414	4.36	236	275 305
336.....	..	.....	11- 1-01	4,796	5.00	239	279 340
112.....	10	Gr. Jersey	3-23-02	5,481	4.57	250	292 262
326.....	7	Native....	10- 6-01	5,285	4.79	253	295 335
114.....	10	Native....	1- 5-02	6,407	4.00	256	299 275
210.....	10	Native....	12- 8-01	5,201	5.07	263	307 305
87.....	9	Native....	2-23-02	5,500	4.85	266	311 253
161.....	7	Gr. Jersey	4-13-02	5,731	4.70	269	314 300

## Group 4.—Cows Producing Less than 325 lb. of Butter Fat.

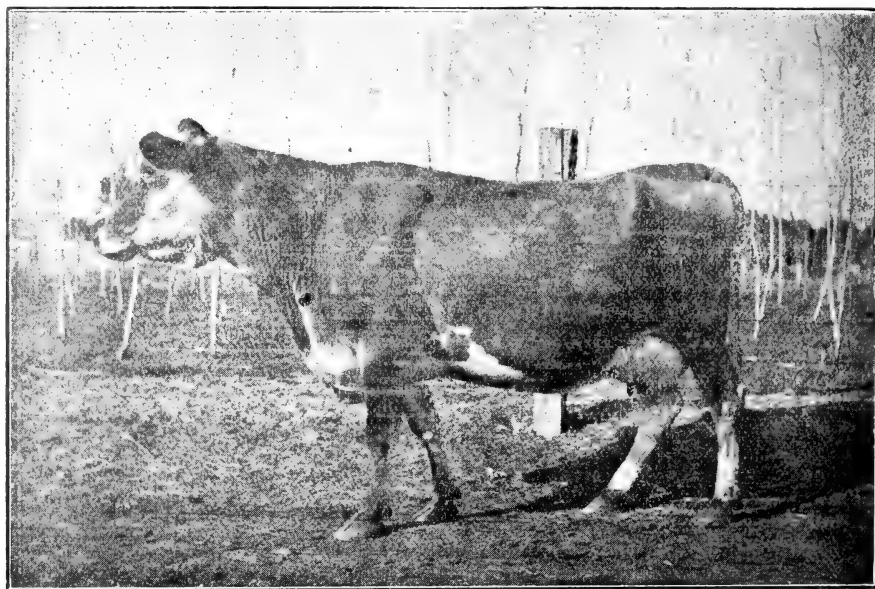
113.....	9	Native....	3-23-02	5,577	4.99	278	324 295
103.....	9	Native....	3-23-02	6,286	4.46	280	327 260
80.....	..	.....	11-24-01	5,551	5.14	285	332 309
199.....	8	Gr. Jersey	3-13-02	6,132	4.75	291	340 309
70.....	11	Native....	6- 2-02	6,732	4.34	292	341 330
309.....	..	.....	7-21-01	7,979	3.75	299	349 365
46.....	11	Native....	11- 3-01	6,549	4.62	302	353 302
190.....	11	Gr. Jersey	6-20-01	5,477	5.60	306	357 365
247.....	10	Native....	3-25-02	6,581	4.76	313	366 274
38.....	10	Gr. Jersey	8- 4-02	7,199	4.36	313	366 265

## Group 5.—Cows Producing Less than 405 lbs. of Butter Fat.

249.....	5	Native....	1-19-02	6,811	4.79	326	380 211
206.....	9	Native....	10-20-01	7,130	4.71	336	392 350
102.....	7	Gr. Jersey	11-17-01	6,501	5.46	355	414 300
95.....	6	Native....	6-12-01	7,615	4.85	369	430 300
147.....	8	Native....	12- 1-01	7,890	4.70	371	432 275
262.....	8	Native....	10- 6-01	9,272	4.01	372	434 330
283.....	8	Gr. Holst.	12- 1-01	10,151	3.68	374	436 316
317.....	5	Holstein..	9-22-01	10,059	3.79	381	445 365
184.....	10	Gr. Jersey	3- 9-02	7,997	4.77	382	445 335
129.....	10	Gr. Holst.	11-15-02	8,949	4.52	404	472 325

## Report of Herd "E."

This was a small dairy of seven cows, but each one proved herself to be a profitable animal. The herd consisted of grade Ayrshires, natives,



**Cut 20. Jennie, Herd E, Gave in One Year 4,449 lbs. Milk; Average Test, 5.01 %; 260 lbs. Butter; Net Profit, \$35.17.**

and one grade Jersey; the average weight was 950 pounds. The cows were well fed and cared for during the test, and at the end of the year they were in good healthy condition. No caked udders, abortions, or other mishaps came to this herd during the year and no cows were sold, for every one in the herd gave the owner a good profit. Nearly all the cows came fresh the last of September and the first of October, and went dry in August. It was a winter dairy.

In October and November the cows received five pounds of bran, five pounds of corn meal, corn stover, and some pasture.

In December and to January 15 they received the following:

## Ration 12.

Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy- drates.	Fat.	Cost.
Grano-gluten .....	2.5	2.35	.667	.970	.305	2.2c
Bran .....	6.0	5.31	.774	2.406	.204	5.4c
Corn and cob meal .....	4.0	3.40	.176	2.400	.116	4.0c
Millet .....	5.0	4.40	.160	2.425	.050	2.5c
Stover .....	10.0	5.95	1.70	3.240	.070	2.0c
Total nutrients .....		21.41	1.947	11.441	.745	16.1c

This is not only a balanced ration but it contains a variety of food stuffs and is palatable. Palatability should always be considered in making up a ration for a dairy cow.

From January 15 to March 1 the cows received the following ration: Six pounds of bran, three pounds of grano-gluten, five pounds of timothy hay, and all the corn stover they would eat up clean.

In March and to April the 10th, they received 2.5 pounds of bran, 2.5 pounds of grano-gluten, five pounds timothy hay, and corn stover ad libitum.

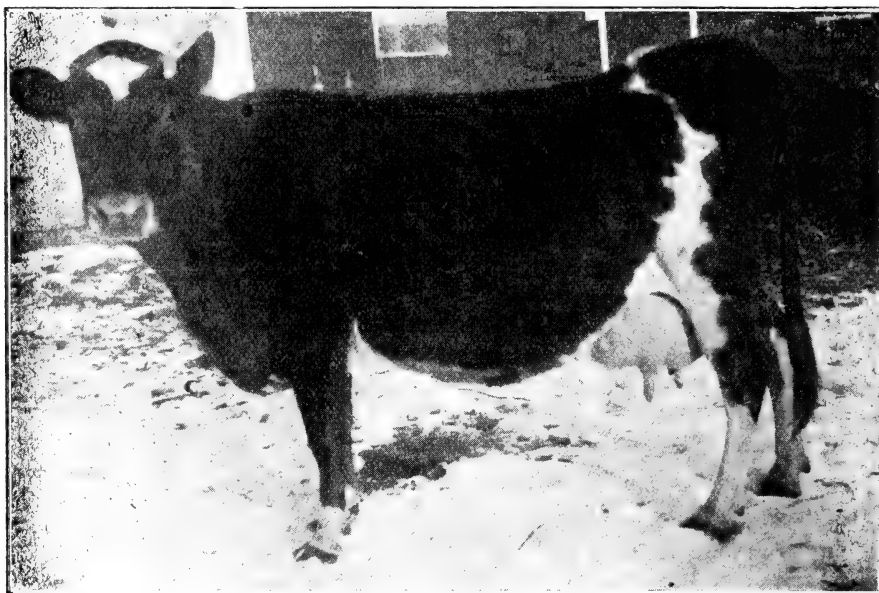
The first part of April the cows were turned out to rye pasture, and about the 15th of May were turned to blue-grass pasture. The herd was given no grain from April 10 to the completion of the year's work. It might be said that the rye pasture was plowed and planted to corn—in other words, this farmer had a good pasture for a month by simply sowing his intended corn ground to rye in the fall. The cows liked the rye pasture so well that they cared nothing for grain when they were grazing in this field.

	Milk, lb.	Fat, %	Fat, lb.	Butter, lb.
Best cow, Brindle .....	7,828	4.41	345	403
Poorest cow, Star .....	5,398	3.89	210	245
Average record of entire herd....	6,474	4.19	271	317

Brindle charged 39.1 cents to make 100 pounds of milk, and 8.8 cents to make one pound of butter fat.

Star charged 54.4 cents to make 100 pounds of milk, and 13.9 cents to make one pound of butter fat.

The average cost of production was 43.8 cents to make 100 pounds of milk, and 10.4 cents to make one pound of butter fat.



Cut 21. Pet, Herd E, Gave in One Year 7,488 lbs. Milk; Average Test, 4.56%; 398 lbs. Butter; Net Profit, \$48.07.

Brindle gave the largest profit, which was \$49.97, and Star the least, which was \$20.54.

The average profit for each cow in the dairy was \$35.80.

There were no unprofitable cows in this herd, for the owner has always given considerable attention to the selection of his dairy animals.

Table 10.—Showing Profit for Each Cow in Herd "E" for One Year.

Name of cow.	Milk, lb.	Fat, %	Fat, lb.	Butter lb.	Gross returns.	Cost of feed.	Net profit.
Star .....	5,398.4	3.89	210.42	245.49	\$49.91	\$29.37	\$20.54
Red Ellis .....	5,707.3	4.09	233.89	272.87	55.23	28.48	26.75
Line Back .....	6,552.9	4.08	267.50	312.08	65.54	30.66	34.88
Jennie .....	4,449.9	5.01	223.30	260.51	54.66	19.49	35.17
Blacky .....	7,896.7	3.55	280.44	327.18	65.94	30.69	35.25
Pet .....	7,488.9	4.56	341.95	398.94	77.44	29.37	48.07
Brindle .....	7,828.7	4.41	345.73	403.35	80.63	30.66	49.97

Table 11.—Record of Each Cow in Herd "E" for One Year.

Age,			Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but- in	
Name of cow.	yr.	Breed.					ter.	milk.
Star .....	3.5	H. & J....	10-15-02	5,398	3.89	210	245	320
Jennie .....	6	Jersey...	1- 8-02	4,449	5.01	223	260	245
Red Ellis .....	6	J. & S. H.	9-20-01	5,707	4.09	233	272	315
Line Back .....	5	Native...	9-20-01	6,552	4.08	267	312	275
Blacky .....	4	Native...	9-15-01	7,896	3.55	280	327	280
Pet .....	8	Gr. A'sh'e	9-25-01	7,488	4.56	341	398	330
Brindle .....	9	Gr. A'sh'e	9-28-01	7,828	4.41	345	403	327

## Report of Herd "F."

There were fourteen full-blood Holstein cows in this herd that were tested; their average weight was about 1,050 pounds. A few of the cows that did not enter the test were disposed of before the end of the year, for they had already proved themselves to be inferior and unprofitable animals. Less than half the dairy was matured cows. The herd was well cared for, but they did not receive a very large grain ration during the year, for the owner thought it would be more profitable to make less milk and butter fat than it would be to buy feed for his cows; the price of all kinds of grain being so very high last year.

The herd was kept in comfortable quarters, was in healthy condition during the test, and did a good year's work considering the grain that was given them.

The first period of the test the cows received a good ration which contained the following food stuffs:

## Ration 13.

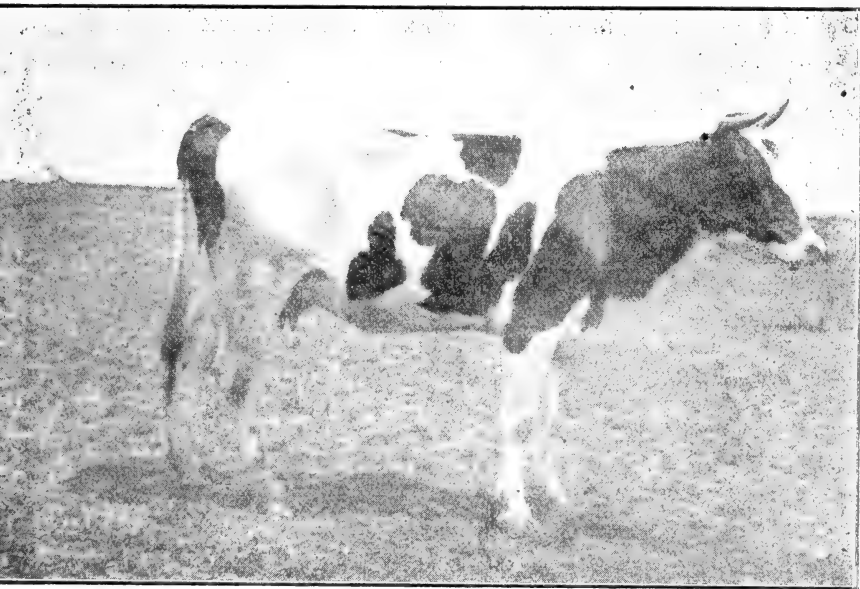
Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy- drates.	Fat.	Cost.
Bran .....	4	3.54	.516	1.604	.136	3.6c
Timothy hay .....	5	4.23	.340	1.790	.085	2.5c
Oats .....	4	3.56	.368	1.892	.168	4.4c
Stover .....	10	5.95	.170	3.240	.070	2.0c
Silage .....	35	7.31	.315	3.955	.245	3.5c
Total nutrients .....		24.59	1.709	12.481	.704	16.0c



Cut 22...Check. Herd F, Gave in One Year 6,812 lbs. Milk; Average Test, 3.16%; 251 lbs. Butter; Net Profit, \$19.30.

This is a very good ration for it contains a variety of feeds and enough nutrients for cows giving good flows of milk. The dry grains and dry roughage are mixed and in about the right proportion to the amount of corn silage. It is, perhaps, a little deficient in protein for heavy milking cows.

The second period of the test the cows received no grain. The ration consisted of thirty-five pounds of corn silage, five pounds clover hay, and all the corn stover they would eat. Each cow shrank considerably in milk flow, and the average per cent of fat was less during this period. The cows received the following ration from the first of February until they were turned out to grass:



Cut 23. Maid, Herd F, Gave in One Year 5,979 lbs. Milk; Average Test, 3.34%; 233 lbs. Butter; Net Profit, \$17.95.

Ration 14.

Food stuffs.	Lb.	Dry matter.	Pro-tein.	Carbohy- drates.	Fat.	Cost.
Grano-Gluten .....	2	1.88	.534	.776	.248	1.8c
Silage .....	35	7.31	.315	3.955	.245	3.5c
Clover hay .....	5	4.23	.340	1.790	.085	2.5c
Corn stover .....	10	5.95	.170	3.240	.070	2.0c
Total nutrients .....		19.37	1.359	9.761	.648	9.8c
Oat straw, ad libitum.						

This is a better ration than the one that was fed during the second period of the test, and there was an increase in milk flow and an increase in per cent of fat. The cows were turned out to pasture about June 19. The owner did not have enough pasturage to feed his herd entirely so the

ration was supplemented with thirty pounds of corn silage a day. This ration was continued to the completion of the test. It is the belief of the owner that the cows would have given a larger profit if he had fed them more grain. While the above facts do not demonstrate that the herd would have been more profitable with better feeding, yet, judging by the individuality of each of the cows, better results might have been expected if more grain had been fed. The cows were certainly capable of giving more milk and butter fat than the records show, if they had received a better ration.

**Yearly Record of Best and Poorest Cow in Herd "F," and Average for Entire Herd.**

	Milk, lb.	Fat, %	Fat, lb.	Butter, lb.
Best cow, Princess .....	7,817	3.35	262	305
Poorest cow, Mittie .....	3,461	3.19	110	128
Average record of entire herd ....	5,846	3.32	194	227

Princess, the best cow, charged 33.5 cents to produce 100 pounds of milk, and 10 cents to make one pound of butter fat; and Mittie charged 62.3 cents to produce 100 pounds of milk, and 19.5 cents to make one pound of butter fat.

The average cost of production was 42.9 cents to yield 100 pounds of milk, and 12.9 cents to make one pound of butter fat.

Princess gave a profit of \$32.63 and Mittie a profit of \$2.75.

The average profit for each cow in the dairy was \$18.58.

**Table 12.—Showing Profit for Each Cow in Herd "F" for One Year.  
Group 1.—Kept at a Profit.**

Name of cow.	Milk, lb.	Fat, %	Fat, lb.	Butter lb.	Gross returns.	Cost of feed.	Net profit.
Mittie .....	3,461.8	3.19	110.54	128.96	\$24.33	\$21.58	\$2.75
Lady .....	4,386.4	3.39	149.05	173.89	34.41	22.66	11.75
Joe's Bride .....	5,136.7	3.00	154.32	180.04	32.31	20.47	11.84
Loma .....	5,677.1	3.14	178.44	208.18	40.96	27.85	13.11
Bell .....	5,050.2	3.61	182.56	212.98	38.89	23.94	14.95
Maid .....	5,979.1	3.34	200.12	233.47	44.22	26.27	17.95

**Group 2.—Kept at a Fair Profit.**

Mutual .....	5,586.5	3.25	181.82	212.12	\$41.07	\$22.11	\$18.96
Check .....	6,812.6	3.16	215.79	251.75	50.22	30.92	19.30
Maud .....	5,426.9	3.39	184.36	215.08	42.54	22.66	19.88
Zipsy .....	6,219.2	3.53	219.73	256.35	49.03	26.57	22.46
Echo .....	6,039.6	3.66	221.16	258.02	50.03	27.52	22.51



## Group 3.—Kept at a Good Profit.

Name of cow.	Milk, lb.	Fat, %	Fat, lb.	Butter lb.	Gross returns.	Cost of feed.	Net profit.
Zur .....	6,610.0	3.29	218.01	254.34	\$49.58	\$25.55	\$24.03
Alfrida .....	7,641.5	3.22	246.10	287.11	55.55	27.52	28.03
Princess .....	7,817.4	3.35	262.28	305.99	58.88	26.25	32.63

Table 13.—Record of Each Cow in Herd "F" for One Year.

## Group 1.—Cows Yielding Less than 180 Lbs. of Butter Fat.

Name of cow.	Age, yr.	Breed.	Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but-ter.	in milk.
Mittie .....	3	Holstein..	7-17-02	3,461	3.19	110	128	260
Lady .....	4	Holstein..	12- 1-01	4,386	3.39	149	173	300
Joe's Bride .....	9	Holstein..	4- 5-02	5,136	3.00	154	180	275
Loma .....	12	Holstein..	2-13-02	5,677	3.14	178	208	235

## Group 2.—Cows Yielding Less than 205 Lbs. of Butter Fat.

Mutual .....	2	Holstein..	11-18-01	5,586	3.25	181	212	315
Belle .....	3	Holstein..	5-28-02	5,050	3.61	182	212	302
Maud .....	3	Holstein..	12- 1-01	5,426	3.39	184	215	300
Maid .....	3	Holstein..	10- 9-01	5,979	3.34	200	233	330.

## Group 3.—Cows Yielding Less than 275 Lbs. of Butter Fat.

Check .....	15	Holstein..	1-23-02	6,812	3.16	215	251	252
Zur .....	2	Holstein..	1-31-01	6,610	3.29	218	254	305
Zipsy .....	3	Holstein..	10-13-01	6,219	3.53	219	256	335
Echo .....	4	Holstein..	10-11-01	6,039	3.66	221	258	334
Alfrida .....	7	Holstein..	10-14-01	7,641	3.22	246	287	336
Princess .....	4	Holstein..	8-26-01	7,817	3.35	262	305	330

## Report of Herd "G."

There were only five cows in this herd at the beginning of the test and two of them were sold three months after the work began. The strange thing about the selling of these animals was that they were good cows, for they had averaged seven and one-half pounds of butter fat a week up to the time that they were disposed of. The herd was not well fed or cared for, but did a very fair year's work, notwithstanding. The cows were not kept in a comfortable barn, or one that was well cleaned. The dairy with this man was, so to speak, a sort of necessary evil.

The amount of grain and roughage that each cow consumed during the year was not kept, so there is no feed account reported.

Table 14.—Record of Each Cow in Herd "G" for One Year.

Name of cow.	Breed.	Milk, lb.	Fat, %	Fat, lb.	Lb. of butter	Days in milk.
Jersey .....	Gr. Jersey...	3,644	3.96	144	168	275
Mollie .....	Native.....	3,930	3.94	155	180	210
Lucy .....	Native.....	7,021	3.94	277	323	280

#### Report of Herd "H."

This herd consisted of eight native cows whose average weight was about 1,000 pounds. The cows were very ordinary animals and they did a very ordinary year's work. The most of them calved in March, and were dry by the first of November, the owner not trying to make milk in winter. The barn in which these cows were kept was very poor, being cold and poorly cared for. The stock was often exposed to cold, rain, and snowstorms, and the frozen snow and ice was often removed with brooms from the animals' backs.

In March and April the cows received a small amount of bran and corn meal and about one pound of oil meal a day, with clover hay and corn stover. By May 15 the cows were turned into a pasture which was not very good, the greater portion of it being woods. They received in connection with pasturage about two pounds of bran a day, but this was not enough grain when the kind of pasture is considered. The latter part of July the cows were changed to a good clover pasture.

Table 15.—Showing Record of Two Cows Every Seventh Week During Their Period of Lactation.

Fanny.					
Week ending.	Milk, lb.	Fat, %	Fat, lb.	Butter, lb	
March 31 .....	192.4	3.2	6.16	7.18	
May 19 .....	142.4	4.3	6.12	7.14	
July 7 .....	84.3	4.0	3.37	3.93	
August 25 .....	7.0	6.9	.48	.56	
Lily.					
May 19 .....	171	3.9	6.67	7.78	
July 17 .....	99	3.5	3.47	4.04	
August 25 .....	123.9	3.6	4.46	5.20	
October 27 .....	75.2	4.1	3.08	3.59	

These tables are good examples of the milk and butter fat yield of all the cows at different times during the test. They clearly show that the cows were not persistent milkers. The individuality of the cows, the poor feeding which they received, undoubtedly caused the rapid decline in milk and butter fat production from one period to the next and their short period of lactation.

The cows gave more milk and butter fat in the August test than they did in July. This was probably due to the fact that the cows were taken from a poor wood pasture the last of July and put into a good clover pasture.

**Yearly Record of Best and Poorest Cow in Herd "H," and Average for Entire Herd.**

	Milk, lb.	Fat, %	Fat, lb.	Butter, lb.
<b>Best cow, Jessie</b> .....	5,420	4.08	221	258
<b>Poorest cow, Fanny</b> .....	2,398	3.92	94	109
<b>Average record of entire herd</b> ....	3,852	4.02	155	180

**Table 16.—Record of Each Cow in Herd "H" for One Year.**

Name of cow.	Age, yr.	Breed.	Date of calving.	Milk, lb.	Fat, %	Fat, lb.	Lb. of Days but- in ter. milk.	
Fanny .....	..	Native...	3-20-02	2,398	3.92	94	109	195
Lucy .....	2	Native...	3-31-02	2,843	4.31	122	143	230
Bess .....	4	Native...	2-20-02	3,895	3.70	144	168	240
Lily .....	2	Native...	3-25-02	3,937	3.80	149	174	225
Liza .....	5	Native...	3-13-02	3,980	4.07	162	189	230
Reddie .....	6	Native...	1-21-02	3,848	4.23	163	190	235
Belle .....	7	Native...	3-23-02	4,498	4.07	183	213	215
Jessie .....	5	Native...	3-22-02	5,420	4.08	221	258	216

It is perhaps well to compare the performance of eight of the poorest cows as well as eight of the best cows kept in different herds, and also compare the average production and profit of each herd tested. This is done to show the great differences, even among the poorest and best cows, and also the difference in production and profit between herds of cows kept upon the farms of Illinois.

Table 17.—Comparing the Performance of the Poorest Cows Kept in Different Herds.

Cow.	Herd.	Milk, lb.	Fat, %	Lb. of butter.	Net profit or loss.	Cost of 100 lb. of milk.	Cost of 1 lb. of fat.
No. 37 .....	"A"	1,482	3.97	68	\$—*17.83	\$2.07	52.2c
Harrison .....	"C"	2,721	3.96	126	— 1.27	.97	24.6c
Red Bird .....	"B"	4,974	3.04	176	— 1.28	.70	23.2c
No. 44 .....	"D"	3,399	4.58	181	— .18	1.03	22.4c
Mittie .....	"F"	3,461	3.19	128	2.75	.62	19.5c
Star .....	"E"	5,398	3.89	245	20.54	.54	13.9c
Jersey .....	"G"	3,644	3.96	168			
Fanny .....	"H"	2,398	3.92	109			

\* This is estimated on the basis that it took 140 lbs. of butter fat to pay for feed.

Table 18.—Comparing the Performance of the Best Cows Kept in Different Herds.

Cow.	Herd.	Milk, lb.	Fat, %	Lb. of butter.	Net profit.	Cost of 100 lb. of milk.	Cost of 1 lb. of fat.
Jersey .....	"C"	5,498	4.48	287	\$34.77	29.7c	6.6c
No. 147 .....	"D"	7,890	4.70	432	57.22	35.5c	7.5c
Brindle .....	"E"	7,828	4.41	403	49.97	39.1c	8.8c
Princess .....	"F"	7,817	3.35	305	32.63	33.5c	10.0c
Spotty No. 1 .....	"B"	7,711	3.20	288	25.32	40.7c	12.6c
No. 15 .....	"A"	6,145	3.63	260	*18.40	50.1c	13.7c
Lucy .....	"G"	7,021	3.94	323			
Jessie .....	"H"	5,420	4.08	258			

\* This is estimated on the basis that it took 140 lbs. of butter fat to pay for feed.

Table 19.—Comparing the Average Performance of All the Cows in Each of the Herds Tested

Herd.	Milk, lb.	Fat, %.	Lb. of butter.	Net profit or loss.	Cost of 100 lbs. of milk.	Cost of 1 lb. of fat.
"A" .....	3,361	3.55	139	\$ 4.54	92.5c	25.8c
"B" .....	5,360	3.52	220	12.12	57.0c	16.1c
"C" .....	4,942	3.90	224	16.22	55.5c	14.2c
"F" .....	5,846	3.32	227	18.58	42.9c	12.9c
"D" .....	5,911	4.45	306	26.64	54.9c	12.3c
"E" .....	6,474	4.19	317	35.80	43.8c	10.4c
"G" .....	4,865	3.95	224			
"H" .....	3,852	4.02	180			

Table 20.—Comparing the Results from the Six Most Profitable Cows in Herd "D" with the Results from Five Other Herds.

Herd.	No. of cows. in herd.	Lb. milk.	Lb. butter.	Total profit.	Total loss.
"D" .....	6	50,669	2,644	\$296.97	\$.....
"A" .....	28	94,126	3,899	.....	127.12
"B" .....	20	107,217	4,400	242.41	.....
"C" .....	17	84,014	3,823	275.90	.....
"E" .....	7	45,322	2,220	250.63	.....
"F" .....	14	81,845	3,178	260.15	.....

This table simply shows that a few good cows will yield a greater profit than large herds of unselected animals. It was found in herd "D," that fifteen of the best cows gave a profit of \$61.94 while the other thirty-two cows gave a profit of only \$600.24, or, the fifteen cows gave the owner \$51.70 more profit than the other thirty-two cows. It shows very clearly that it is far better to keep a few very good cows than large herds of ordinary cows. The work is less and profit larger.

We will now listen to Prof. Haecker, of Minnesota.

By the Secretary.—I asked him about coming to the dairy barn in the judging of cows and he agreed to come, and then he said there was nothing more tonight. I was out this afternoon when he was talking and supposed he finished, and had in mind only the fact he was not on the program this evening.

By the President.—He has kindly consented to be with us throughout tomorrow when we will have a chance of listening to him.

We will now listen to Prof. Fraser of our own college.

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#### DAIRY CONDITIONS AND SUGGESTIONS FOR THEIR IMPROVEMENT

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By W. J. Fraser, M. S., Chief in Department of Dairy Husbandry,  
University of Illinois.

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The Department of Dairy Husbandry, of the Illinois Agricultural Experiment Station, has for the past six years been investigating the dairy conditions of the state. The results show that in some particulars the conditions are ideal while in others they are far below the proper standard. From a sanitary standpoint there is need of improvement in many of the dairy practices not only in Illinois but in all parts of the United States and, in fact, in all countries of the world.

Dairy products are not consumed to the extent they would be were it not for their too frequent poor quality. Under existing conditions it is, in many places, almost if not quite impossible to obtain on the open market any really good butter or cheese. It is also difficult to obtain milk that is produced in such a manner as to make it a safe and wholesome food for infants and invalids, if indeed for healthy adults. When milk is ordered even at our best hotels and restaurants, dirt is frequently found at the bottom if it is allowed to stand for a short time. This is not appetizing to say the least and many persons who like milk now use as little as possible on account of the careless manner in which it is produced and the fear that it may contain dirt if not disease germs.

The commercial value of dairy products is determined very largely by their flavors and odors. They are usually judged by the smell which is so extremely delicate that it takes but an exceedingly small amount of a substance giving off a bad odor to make the product of low or inferior quality. No food is more susceptible to defects or more subject to contamination than dairy products and yet the protection of their purity until they reach the consumer is nothing more nor less than cleanliness. This would seem to be a simple matter yet it is one greatly neglected, but when faithfully performed will more than repay the efforts made.

Many people when handling milk seem to forget that they are dealing with food products. There is a tendency for certain unfortunate practices to invade the dairy business. If filth is allowed to get into milk or it becomes tainted at any point of its production, no amount of care either before or after can make amends for the difficulty. A man may be careful and correct in all of his dairy operations but one, and yet this one be the cause of his producing a low grade product. This one mistake not only injures his product but the dairy market as well. This being true, it is clear that the greatest care should be exercised in every step of production, manufacture, and delivery of dairy products to the consumer. Only those dairymen who exercise such care can hope to secure the trade of people who desire a product of superior quality and are willing to pay an advanced price.

The real foundation of the whole dairy business lies in the milk producer. The chief necessity then in improving the dairy conditions is to give the producer such a knowledge of the right methods of handling and caring for milk that he will not only see the necessity for such methods but may also know how best to accomplish this purpose.

Some dairymen think if they do not get a good price for their milk at the creamery that the fault lies with the creamery; but the patrons produce the butter, the creamery only separates it. Patrons should not forget that the interest of the creamery and their own are the same. Dairy education has benefited creamery operators more than it has the patrons. The statement was recently made by one of our best informed dairy and creamery men that—"Milk does not come to the creamery in so clean a condition today as it did twenty years ago." Before the day of the separator, milk was not accepted unless it reached the creamery in

fairly good condition. Now, if it is not sour enough to clog the separator, it is received at the weigh-can of many creameries. When every man made his own butter on the farm and sold it himself, he came into closer touch with the trade and was more particular about the cleanly methods of its production. Since the creamery has come in between the milk producer and the butter market there is a tendency to become more careless in the production of milk. When milk is delivered in poor condition at a creamery or cheese factory, no butter or cheese maker, however skilled, can make the best product from it. If all of the patrons but one bring milk that is clean and in good condition, the man bringing dirty milk spoils the whole.

The condensing factories have been the greatest factor in raising the standards of milk production upon the dairy farms of the state. They make certain requirements in regard to the methods used in the production of milk delivered at their factories and have inspectors to see that their instructions are carried out.

The particular points touched upon in this bulletin are the ones found to be most commonly at fault in actual practice. The object of this bulletin is to show how these may be remedied and to point out the essentials of good dairying. It must not be inferred, however, that the Experiment Station recommends expensive buildings and equipment in the production of clean sanitary dairy products, for these are not essential. It costs little more to be clean than unclean. It does, however, require a little more labor.

#### **Location of Barn and Care of Yard.**

In the production of clean milk no one thing is of more importance than keeping the cows out of the mud. Many yards into which dairy cows are turned each day for their drink and exercise, are knee deep with mud and manure during the winter and spring, if not nearly the entire year. In summer when the cows are on pasture they would keep comparatively clean were they not obliged to wade through a filthy yard in going to the stable.

In locating a dairy barn care should be taken to have a gentle slope from the barn in at least one direction, affording a good natural drainage for both barn and yard. If the barn is already built and poorly located,



draining and grading will do much to remedy the evil. In most cases it would take but a small amount of labor with plow and scraper, when the ground is in suitable condition to handle, to give the surface of the yard a slope from the barn sufficient to carry off the surface water. Even if dirt has to be hauled in from outside the yard to accomplish this it will not be expensive. The drainage alone under a yard is not sufficient, as the tramping of the cattle soon puddles the surface, preventing the water from passing down to the tile.

After the grading is done the yard should be covered with gravel or cinders. By putting the coarser in the bottom and the finer on top a good hard yard can be obtained and at a comparatively small expense where material of this kind is available. If this cannot all be done in one year, it is of the utmost importance that a beginning be made by grading and graveling a portion of the yard next the barn, so that the cows may have some place on which to get out of the mud and filth. By grading a part of the yard each year and applying a thick coat of gravel or cinders to the graded part, the entire yard will, in a few years, be in good condition. When gravel does not contain enough clay to pack hard, a small amount of clay should be mixed with the top layer. It will then form a firm surface.

A portion of the yard should be bedded, thus affording the cows a place to lie in the open air on pleasant days. If straw is scarce the cleanest of the soiled bedding from the stable will answer for this purpose. When the straw and manure on this bedded portion of the yard becomes too deep and soft it should be hauled into the field and the bedding commenced again on the solid ground.

It is advisable to haul the manure directly to the field from the barn, but if this is not feasible it should be removed at least 100 feet from the barn. In no case should it be allowed to accumulate against or near the dairy barn and no swine pen should be nearer than 200 feet on account of the odors being readily absorbed by milk.

#### **Cleanliness in Milking.**

To determine definitely the amount of filth that gets into milk during the process of milking and how much this can be lessened by washing the udders the following work was done:

Amount of dirt caught under washed and unwashed udders during milking. The glass weighing tubes shown below are natural size.

UDDER MUDDY.

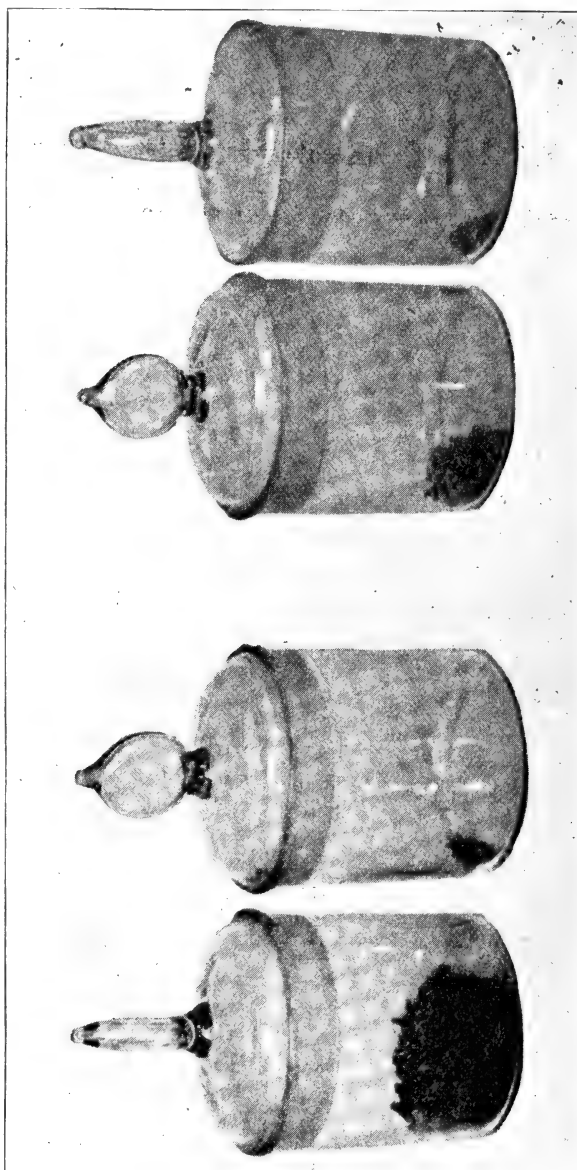
Before Washing.

After Washing.

UDDER SLIGHTLY SOILED.

Before Washing.

After Washing.



The average weight of dirt that falls from muddy udders during milking is 90 times as great as that which falls from the same udders after washing, and when udders are slightly soiled it is 22 times as great.

It was determined after several trials with three different milkers on thirty cows that it requires an average of  $4\frac{1}{2}$  minutes to milk a cow. A glazed dish eleven inches in diameter, the size of an ordinary milk pail, was placed in the top of a pail and held under a cow's udder in the same position as when milking. For  $4\frac{1}{2}$  minutes the milker then went through motions similar to those made in milking but without drawing any milk. The amount of dirt which fell into the dish during the operation was, of course, approximately the same as would have gone into the milk during the milking process. The dirt caught in the dish was then brushed into a small glass weighing tube, the udder washed and the process repeated. The dirt which fell from the washed udder was also carefully brushed into a weighing tube. Both tubes were then placed in a desiccator and after drying twenty-four hours were accurately weighed on a chemical balance.

Sixty trials were made at different seasons of the year. With udders that were apparently clean it was found that an average of  $3\frac{1}{2}$  times as much dirt fell from the unwashed udders as from the same udders after they were washed. With soiled udders the average was 22 and with muddy udders the average was 94 times as much dirt from the unwashed udders as from the same udders after washing.

#### Barn and Stables.

Costly barns or stables are not essential to the production of clean milk or to the maintenance of a dairy herd at its highest efficiency. To obtain the best results it is important, however, that the cows be kept comfortable at all times. To do this there are several essentials with which a barn must be provided. It must have a roof that does not leak; sides that do not allow the wind to blow through; and doors that will close tightly.

Many barns are not provided with any system of ventilation whatever, as but few dairymen realize that pure air is just as essential to the economic production of untainted milk as is the feed a cow consumes. Digestion and assimilation, like the burning of coal but if the drafts are kept combustion. The stove may be filled with coal but if the drafts are kept tightly closed the coal will not burn, as sufficient oxygen is not provided. Neither can a cow's feed be properly digested and assimilated without an

abundance of oxygen, and unless this is supplied a great waste of food as well as impaired health of the cow will result.

Much has been said about the number of cubic feet of air space that should be allowed for a cow, but this is of little consequence in comparison with the more important question of ventilation, or change of air. In order not to get a greater degree of impurity in the air than is permissible with good results each cow should be supplied with 3,540 cubic feet of air per hour. The size of the ventilating flues to be provided will depend upon the number of cows in the stable. About four square feet is a good size for a ventilating flue and if so constructed as to cause the air to travel 300 feet a minutes this will furnish ventilation for twenty cows. Two flues this size would be sufficient for forty cows and five would be required for one hundred cows.

To be sanitary a dairy barn should be whitewashed at least once a year. An interior with a few boards laid overhead at irregular intervals, with hay hanging through and with the sides in no better condition, cannot be properly whitewashed. The ceiling should be tight, excluding all dust and chaff from above, and sides smooth, thus affording a firm surface to which the whitewash can cling.

To be sanitary a barn should be whitewashed at least once a year. It is not necessary to ceil the barn with surfaced lumber, in fact, the whitewash will adhere better if the surface is not too smooth. The boards must, however, be reasonably clean before the whitewash is applied, otherwise it will be of little use, for it will soon shell off with the filth; and besides this, filth simply covered is not removed.

Whitewash is one of the cheapest disinfectants and can be easily and rapidly applied with a spray pump. It must be carefully strained before using in the pump as any lumps will clog the spray nozzle.

A cement floor is the most sanitary for a cow stable and when put down it should be left rough under the float to prevent the cows from slipping. An objection often made to cement floors is that they are cold in winter, but as the temperature in a dairy barn should never get below 40 degrees F. this objection is largely overcome, if the cows are properly bedded. When a plank floor is used it must be renewed as fast as it wears or rots out.

It is of the utmost importance in keeping cows clean that the platform on which they stand be of proper length. If it is too short the cows cannot lie down comfortably and if too long the droppings will fall on the rear of the platform and the cows will become soiled when lying down. As cows vary in length the platform should be longer, from the manger to the gutter, at one end of the barn and gradually taper to six or eight inches shorter at the other end. When large herds are kept the platform on one side of the barn may be longer than on the other side and the cows arranged accordingly. A still better arrangement is some form of movable manger so that the length of the platform can be adjusted to suit each individual cow. With this arrangement all can be lined up on the gutter, which will be a great help in keeping the cows clean.

#### The Care of Milk.

As soon as it is drawn milk should be removed from the stable to a place provided for the purpose and there aerated and cooled to 50 or 60 degrees F. This should be done either by setting the cans into a tank of cold water and stirring occasionally or by passing the milk over a cooler. The latter method is to be preferred if the cooling can be done in a pure atmosphere free from dust. It is of great importance to have a small milk house or some clean room away from the odors of the stable in which to care for milk.

The sooner milk is thoroughly cooled after it is drawn, and the lower the temperature to which it is taken, the better. Bacteria that get into milk during the process of milking develop very rapidly so long as milk remains at about the temperature at which it was drawn, but as soon as cooled to 60 degrees they develop slowly, and if cooled to 40 degrees their action is almost entirely stopped. Milk cooled to this temperature as soon as drawn and held there will remain sweet and in good condition much longer than if cooled to only 70 degrees or 75 degrees.

#### Care of Dairy Utensils.

One of the first essentials in keeping dairy utensils clean is to have a smooth surface. This fact should be kept in mind when purchasing, and if all seams are not flushed smooth with solder this should be done. As soon as the tin is worn off on the inside, exposing the iron, the utensils

should be discarded, for they cannot be properly cleaned when in this condition. All utensils should be washed as soon as possible after using, since the longer the milk remains on them the harder they will be to clean. They should first be rinsed with lukewarm water to remove the milk, then washed with hot water and soap or some alkali, and scalded with boiling water, or with steam if it is available. Cans should never be tightly closed when not in use and should be placed on a rack in an inverted position so that dust cannot blow into them. If possible they should be placed where the sun will shine on them as that will do much toward keeping them pure and sweet.

Bottles used to deliver milk for direct consumption must be taken to the dairy after each using and thoroughly washed and sterilized to kill all disease germs. If this is not done disease may be carried from one house to another by means of the bottles. The practice some dairymen have of bottling milk in the wagon on the route, using bottles collected from the houses just visited, cannot be too strongly condemned and should be prohibited by law.

### The Feed of Cows.

Sudden changes of feed should be avoided, especially if very marked, as in changing from dry to green feed. Special care is required when cows are put on pasture in the spring and when first turned on rye or clover. Only a small quantity of green feed should be given at first, the amount being increased as from day to day the dry feed is reduced. If care is not exercised at such times the cow's system is likely to become deranged and the milk will then have a peculiar, disagreeable odor, but if this method is followed the system gradually becomes adjusted to the new conditions and no bad results follow.

When feeding turnips or cabbage the difficulty is frequently experienced of having disagreeable odors in the milk. This difficulty may be largely if not entirely avoided by feeding after milking rather than just before, as the peculiar odor produced by these feeds will then leave the cow's system before the next milking time.

### Creamery.

The location of a creamery should be such as to insure good drainage. The ground surrounding it should be seeded and the road graveled that so far as possible dust may be prevented from blowing into the building. Cleanliness at a creamery should prevail without and within, not alone because neatness is essential to the production of the highest grade of butter, but also because of its effect upon the patrons. Every creamery should be a nucleus for high standards in dairying. The creamery operator cannot expect his patrons to bring clean milk properly cooled and cared for if the creamery is in a neglected condition, as it would be evident that under such circumstances all care on their part would be lost.

Every creamery, cheese factory, dairy, or milk depot should have the floor, and the walls to the height of at least three feet, of some impervious material. Cement makes the best and cheapest floor when properly laid. Faulty cement work can only be remedied by replacing with another floor.

To carry off more readily the water, the floor should pitch to the gutter. The distance to the gutter should not be more than twelve feet; if it is greater the water will not be carried off rapidly enough. The gutter should pitch to the sewer which should be well trapped and constructed of glazed sewer tile for a distance of at least two hundred feet from the building. At the end of the glazed tile a silt basin should be built of brick, stone, or cement, and ten or twelve inch porous tile laid from this into some well drained ground. From the large tile small laterals should be laid; the number and length needed will depend upon the amount of water to be disposed of and the character of the ground in which the system is laid. If the system is put in and found to be inadequate it can easily be extended by putting in more laterals or making them longer.

If the ground is naturally wet the system can be made much more efficient by laying the tile among these to drain the ground, never getting closer than ten feet to the porous tile carrying the sewage. Much of the solid material in the sewage may be prevented from getting into the porous tile by frequently cleaning the silt basin.

When no siphon is used between the silt basin and the porous tile there is a slow continuous flow of water into the tile which would seep

out into the ground near the silt basin and deposit the solid material in the tile close to the basin. When a siphon is used large quantities are carried over at one time, thus taking the solid material farther down into the porous tile. In time the tile nearest the silt basin will be come filled up with solid material and may have to be cleaned out, but if large tile are used and the silt basin kept clean this system will prove satisfactory.

By the President.—There are one or two matters I would like to mention tonight.

Tomorrow morning at 8:15 there will be a meeting and Prof. Fraser will have charge of it, and Prof. Haecker will do the talking.

Another matter is, I think we ought to have a business meeting tomorrow morning at 10 o'clock. We have seen machinery hall quite a little, and we will have the committees' report at 10 o'clock, for a regular session.

We have quite a little on the program for the afternoon and they will all take time. It seems to me we have taken enough time for machinery hall to have a business session. I would like a motion to that effect.

Mr. Glover makes the motion that this Association meet tomorrow morning for that purpose. Seconded. Carried.

We stand adjourned until 8:15 tomorrow morning.

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### *Thursday Morning, January 8th, 1903*

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By the President.—I see we have a quorum present so will come to order.

The first business we will do this morning is to listen to a report from the Committee on Resolutions.

By Mr. Caven.—The other members of the committee have gone home and left these resolutions with me.

Report of the Advisory Committee of Bill known as 315, by Irvin Nowlan.



Outline for a bill to secure adequate dairy inspection and for other purposes.

1. The present Pure Food Commissioners' law to be repealed.

2. A commission be formed to consist of seven members to serve without compensation, except necessary expenses; one to be selected by each of the following organizations: State Dairymen's Association, State Live Stock Breeders' Association, State Horticultural Society, State Grocers' Association; two members to be appointed by the Governor, one from each of the two leading political parties of the State, and the State Veterinarian. Said commission to select some competent person not a member of the commission, with a salary of \$2500 per year, as an executive officer, who shall have charge of the office and conduct the inspection service under the supervision of the Board of Pure Food Commissioners.

Resolved, That we appreciate the good work done along dairy lines by the Agricultural College under the small appropriation of \$5,000.00 made two years ago in bill known as House Bill No. 315, and that we ask the present legislature for an appropriation of at least \$15,000.00 a year for the purpose of continuing investigation along dairy lines.

Anticipating an appropriation from the legislature, it is necessary that this body take suitable action for the continuation of an advisory committee, and we recommend that such a committee of five be appointed by this body. Two of said committee to hold office for one year, and three for two years. In order to secure the needed appropriation, we recommend that the President of this Association appoint a committee of two to confer with the other allied agricultural organizations named in House Bill No. 315 for the purpose of preparing a new bill to be presented to the present legislature, and using all influence in securing an appropriation in accordance with the provisions of said bill.

Resolved, That we appreciate the good work, as we have seen it here, of the Agricultural College. It is providing in agriculture the practical education so greatly needed in all lines of industry. We are glad to learn that the student can come here for any length of time he may elect, and stay as long as his circumstances may permit and study what he may think will most benefit him. We hope to see this policy extended. In the Dairy Department we hope for further work in lines now followed and which have given such excellent results, and we especially urge that the

Dairy Manufacturing Division receive due appropriation to carry on experimental work in that line, and also to provide for appropriate field work among the creamerymen, milkmen and cheesemakers, for a period of at least thirty days per year.

Resolved, That we renew our allegiance to the National Dairy Union, and take a new resolve to aid the organization in every way we can. Since our previous convention at Freeport, the new oleomargarine law was passed, it becoming effective July 1, has been long enough in operation to show the benefit of driving the fraudulent selling of oleomargarine out of the market that rightfully belongs to pure dairy products. We want to see the fight against the fraud continued until no one who wants butter will be deceived by having oleomargarine palmed off on him as that article. For this victory we thank Ex-Gov. W. D. Hoard, president, and C. Y. Knight, secretary of the National Dairy Union. We thank also the other workers and hope there will be no weakening anywhere of dairy strength in this contest for justice to the great dairy industry. We appeal to the creamerymen of the State to make the pledge of support the National Dairy Union is asking, and to all dairymen and others interested in dairying to aid in this fight as the leaders may request, for they will ask for nothing but that which is necessary and right.

Resolved, That we again endorse E. Sudendorf, of Clinton, Illinois, to have charge of the Dairy Department at the Louisiana Purchase Exposition in St. Louis next year. Mr. Sudendorf's wide acquaintance among creamerymen and dairymen of the country, all of whom are his friends and know his ability; his years of experience in getting together the displays and directing the business of the National Creamery Buttermakers' Association; his ability to make and keep friends; his honesty and fairness make him the ideal superintendent of a great department that will justly represent the immensity of the dairy industry of this country. We who know Mr. Sudendorf know that he can get together a satisfactory display, and one of which the dairy interests will be proud. We believe there is no other man in this country so well fitted to have charge of the Dairy Department.

Resolved, That we express thanks to W. D. Collyer, of Chicago, inspector of dairy products under the Department of Agriculture, for his services in scoring the butter and cheese entered at this convention.

Resolved, That we thank the railroads in the Central and Western Passenger Associations for the reduced rates given us for this meeting. There have been some misunderstandings, but we believe it can all be straightened out without losses.

Resolved, That we thank Mayor Muliken, of Champaign, and Mayor Glover, of Urbana, for their kind welcome, and the citizens of these twin cities for the assistance they have freely given us. We have had a valuable convention, if not so largely attended as others of late years, and we hope we have done this community some good.

Resolved, That we thank Dean Davenport and others of the Illinois Agricultural College for the assistance and help in making this meeting a success. We also thank the speakers on the program who have given us valuable papers that will influence for good not only those present at this convention, but the thousands who will read our report of this convention.

Resolved, That we thank the creamery and dairy machinery and supply houses represented in the exhibit here, and thank also the gentlemen who represented these houses. The latter have contributed liberally to help our association, and their representatives can always be depended upon to work for the good of the Association. A good share of our success is due to their efforts.

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By the President.—You have heard these resolutions. How do you wish to take them up?

Mr. Sawyer.—I move they be adopted as a whole.

Seconded by Mr. Campbell.

By the President.—All in favor say "I." Contrary—

Unanimously carried.

By the President.—We will now listen to the Committee on Nominations.

Report read by Mr. Caven, Secretary, for Mr. Long.

For President—Joseph Newman, Elgin, Ill.

For Vice President—Irvin Nowlan, Toulon, Ill.

For Directors—

Joseph Newman.

Irvin Nowlan.

G. H. Gurler, DeKalb, Ill.

J. R. Biddulph, Providence, Ill.

John Stewart, Elburn, Ill.

John Coolidge, Galesburg, Ill

L. A. Spies, S. Jacobs, Ill.

By the President.—What will you do with this report on nominations? There is a change in the directors. What will you do in regard to the nominations?

Mr. Campbell.—I think we ought to reach out down into Egypt, and they will bring members up with them. I don't think Northern Illinois ought to absorb all the offices.

By the President.—The majority of them are below the center of the State.

Mr. Campbell.—I move they be adopted.

Mr. Glover.—Second the motion.

By the President.—It is moved and seconded that the report be adopted. What will you do? All in favor say "I." Contrary—?

Unanimously voted.

By the President.—Shall it be by ballot or the Secretary cast the ballot if you wish these parties elected.

It is moved that the Secretary cast the ballot of the Association for the officers named in the report that has just been adopted. Are you ready? All in favor say "I." Contrary—

It is adopted and carried. The Secretary announces that he has cast the ballot, and these gentlemen are elected as read for the ensuing year.

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PROTEIN REQUIREMENTS.

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By T. L. Haecker, Professor of Dairy Husbandry, Minnesota  
Dairy School.

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Heretofore our investigations in milk production have been conducted along popular lines to determine the yields of milk and butter fat from various types of cows, cost of production of milk and butter fat, with a few trials, comparing different food stuffs under methods and feeding standards generally employed by our leading teachers, breeders and feeders of cattle, without question as to whether the feeding standards were based upon mere theoretical deduction or whether they were based upon careful, practical demonstration. American literature dealing with feeding domestic animals is largely based upon the teachings of Dr. Emil v. Wolff, an eminent German scientist who, in 1864, published his investigations on the kind and amount of nutrients actually needed by domestic animals in making growth, maintaining the animal body and returning animal products without waste of any of the nutrients. In Wolff's formulated feeding standards are given in great detail the amount of organic matter and digestible nutrients needed by animals at various stages of growth and the amounts needed by the mature bovine in meat and milk production. As an illustration, that required by a cow in milk, weighing 1,000 pounds, was fixed at 24 pounds of dry matter and of digestible nutrients, 2.5 of protein, 12.5 of carbo-hydrates and .4 of ether extract or what is commonly termed fat. Some scientists have objected to prescribed fixed rules for feeding, because animals vary so much in feeding power and productive capacity and to meet this objection Dr. C. Lehmann, of the Berlin Agricultural College, in 1897 modified the Wolff standard by substituting dry matter for organic matter and varies the digestible nutrients according to the daily flow of milk. The wisdom of such a change is obvious, for a cow yielding 22 pounds of milk daily certainly needs more protein, other things being equal, than will one yielding only 11 pounds.

Other standards have been formulated by investigators based upon the feeding practice of prominent dairymen. Atwater and Phelps, of the Connecticut Experiment Station, made a special study of this subject for several winters and submitted a standard which seemed to give best results. Woll, of the Wisconsin station, collected data from the reports of 128 dairymen and submitted a proposed American standard ration for dairy cows based upon the average obtained from the rations fed.

Prof. W. A. Henry, director of the Wisconsin Experiment Station, in his book on Feeds and Feeding, publishes on page 114 a table giving the several feeding standards referred to, which are submitted for reference:

**Table VIII.—American and German Feeding Standards for Dairy Cows, Digestible Nutrients per Day per 1000 Pounds Live Weight.**

RATION	Dry Matter	Digestible Nutrients			Nutritive Ratio
		Protein	Carbohydrates	Ether Extract	
	Lbs.	Lbs.	Lbs.	Lbs.	
Wolff original (German) feeding ration...	24.0*	2.5	12.5	.4	1:5.4
Woll proposed American ration.....	24.5	2.15	13.27	.74	1:6.9
Atwater and Phelps proposed standard...	25.0*	2.5	12 to 13	5 to 8	1:5.6
Wolff-Lehmann modified standard—					
I. When giving 11 lbs. milk daily....	25.0	1.6	10.0	.3	1:6.7
II. When giving 16½ lbs. milk daily...	27.0	2.0	11.0	.4	1:6.0
III. When giving 22 lbs. milk daily...	29.0	2.5	13.0	.5	1:5.7
IV. When giving 27½ lbs. milk daily...	32.0	3.3	13.0	.8	1:4.5
Standard maintenance ration .....	18.0	.7	8.0	.1	1:11.8

\* Organic matter.

It will be seen that none of them made any allowance for the great variation in yield of milk except Dr. Lehmann, who fixes the amount of protein needed daily from 1.6 pounds for a cow yielding 11 pounds of milk daily to 3.3 pounds for one yielding 27½ pounds of milk per day. Dr. Lehmann apparently calculated or found by experimental demonstration that after the .7 of digestible protein for body maintenance was provided for, the remainder of the protein was available for milk production and that .081 of a pound was the amount of protein needed for the production of 1 pound of milk; for 1.60 pounds protein prescribed for a cow giving 11 pounds of milk daily, less .7, the amount needed for maintaining the body,

leaves .9 of a pound of protein available for the production of -- pounds of milk, and  $.9 \div 11 = .08+$ . Again a cow yielding 22 pounds of milk requires 2.5 pounds of digestible protein daily and she requires .7 of a pound for maintenance there is left 1.8 for milk production, and  $1.8 \div 22 = .081+$ , the amount of protein required for one pound of milk according to Dr. Lehmann's revision of the Wolff standard for feeding dairy cows.

While all the feeding standards have been very helpful to feeders, that suggested by Dr. Lehmann seems to be a great improvement because it is in a measure a guide in adjusting the ration to the needs of animals varying in productive capacity. Kuehn, a German scientist of great ability, recognize the necessity of a feeding standard that was not confined to such mathematical exactness as were those of Wolff, so he suggested a standard that ranged in protein content from 1.5 to 2.4 pounds, but it does not appear that he indicated when the minimum or the maximum was required.

During the months of February and March, 1895, an experiment was conducted at this station, comparing timothy with prairie hay in which all foodstuffs were subjected to chemical analysis and each ration was weighed and each milking weighed and tested separately for butter fat with the Babcock test, a complete record of which was published in bulletin 67 of this station, pages 356-378. The following table gives the dry matter and the digestible nutrients consumed daily and the milk and butter fat produced during one of the periods in the trial.

The data so obtained, incidentally revealed that the protein required by cows in milk production was less than the amount prescribed by any of the foregoing standards.

Table IX.—Giving the Daily Average of Dry Matter and Nutrients Consumed and Milk and Butter Fat Produced During Two Weeks Ending March 24.

NAME	Dry Matter per 1000 l w	D. M.	DIGESTIBLE			Av. Daily Yield	
			Pro.	C. H.	Fat	Milk	Butter Fat
Beckley .....	24.33	21.16	1.68	11.22	.50	13.17	.72
Countess .....	24.47	28.80	2.36	15.36	.70	43.55	1.03
Houston .....	27.82	25.26	2.13	13.46	.63	25.99	1.38
Lou .....	24.34	27.02	2.20	14.33	.66	33.58	1.20
Olive .....	26.68	21.13	1.69	11.02	.52	21.66	.93
Reddie .....	27.14	20.63	1.66	10.92	.50	15.25	.78
Belle .....	21.48	20.47	1.76	10.76	.50	19.73	.83
Lydia .....	25.15	27.42	2.23	14.30	.68	27.90	1.01
Quidee .....	25.72	22.92	1.87	11.95	.55	27.05	.96
Sweet Briar .....	25.38	26.98	2.22	14.09	.67	25.80	1.37
Topsy .....	27.75	31.91	2.60	16.65	.79	40.04	1.54
Tricksey .....	25.17	18.83	1.51	9.85	.46	16.02	.87
Total .....		292.53	22.91	153.91	7.16	309.74	12.63
Average .....		24.38	1.99	12.82	.59	25.81	1.05

All the cows calved the fall preceding, except Belle, that was in milk when she came to the station in June. Three were bred in December, 6 in January and 3 in February, so it may be fairly assumed that they were doing just normal work, and that the nutrients required for milk production may be accepted as a fair average of what is required during the period of lactation.

The herd consumed on an average 1.99 pounds of crude protein ( $N \times 6.25$ ) per day, and yielded 25.81 pounds of milk daily, containing on an average 4.06 per cent fat. The Wolff-Lehmann standard gives 2.5 pounds protein as the amount required by a cow yielding 22 pounds of milk daily, while the cows in this experiment produced 25.81 pounds with only 1.99 pounds crude protein. The average weight of the cows during the trial was 950 pounds, and calculating that they required .7 of a pound of protein daily for body maintenance, there remains 1.34 pounds of protein daily for milk production, and since they gave 25.81 pounds they returned one pound of milk to .051 of protein after deducting the calcu-



lated amount needed for body maintenance, instead of .081, the amount supposed to be needed according to the Wolff-Lehmann standard.

In examining the individual record of the cows listed in the table, it will be seen that they varied greatly in amount of protein consumed daily and milk and butter fat produced, and that there was also a marked variation between the cows in the amount of protein consumed to milk produced. By singling out the mature cows in the group that made little if any gain in weight, and calculating the amount of protein needed daily for maintenance, using the same factor employed by Dr. Lehmann, and determining the amount left available for product gives the following table:

**Table X.—Giving Weight of Cows, Protein Eaten, Amount Available for Milk Production, Yield of Milk, Per Cent Fat and Protein to One Pound of Milk.**

NAME	Weight	Protein Daily	Protein for Maintenance	Protein for Product	Yield of Milk	Per Cent Fat	Pro- tein to 1 lb. Milk
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.
Tricksey .....	750	1.51	.52	.99	16.02	5.4	.061
Houston.....	908	2.13	.63	1.50	25.99	5.3	.057
Sweet B. ....	1060	2.22	.74	1.48	25.80	5.3	.057
Olive .....	790	1.69	.56	1.13	21.66	4.2	.052
Topsy .....	1150	2.60	.80	1.80	40.04	3.8	.045
Lydia .....	1086	2.23	.76	1.47	27.90	3.6	.052
Quidee .....	890	1.87	.78	1.25	27.05	3.5	.046
Lou .....	1110	2.20	.62	1.42	33.58	3.5	.042
Countess .....	1177	2.36	.82	1.54	43.55	2.5	.035
Average ....	991	2.09	.69	1.40	29.06	3.9	.048

The cow Tricksey yielded 16.02 pounds of milk daily on only 1.51 pounds of protein, while the Wolff-Lehmann standard prescribes 2 pounds as the amount needed when giving 16.50 daily; Houston gave 25.99 pounds of milk daily and had only 2.13 pounds of protein, while the standard referred to gives 2.5 as the amount needed by a cow yielding 22 pounds of milk, and the cow Topsy gave 40 pounds of what may be considered milk of average quality, with a ration containing 2.6 pounds of protein, while the standard prescribes 3.3 for a cow giving 27.5 pounds. The record

covers a period when the cows were in lactation from four to six months and were therefore doing about average work.

After making a daily allowance of .7 of a pound of protein per one thousand pounds live weight, the cow that yielded milk containing 2.5 per cent fat yielded a pound of milk each .035 of a pound of protein, or 28.57 pounds of milk to one pound of protein available for milk production; the cow that gave milk containing 3.8 per cent fat returned a pound of milk to each .045-lb. of protein, being 22.22 pounds of milk of average quality, to a pound of available protein, and the cows that gave milk containing 5.3 per cent fat returned a pound of milk to each .057 of available protein, being 17.54 pounds of milk to a pound of available protein. The average yield of milk was 29.06 pounds testing on an average 3.9 per cent, being milk of average quality, taking the average test of the cows that contribute milk to Minnesota creameries as a basis, which is 3.85. The average amount of protein provided was 2.09 pounds. The weight of the cows averaged 991, leaving 1.40 pounds of protein available for milk, and returned a pound of milk for each .048 of available protein, or 20.83 pounds of milk to a pound of protein.

The tables cited, however, give the summary of results obtained during a period of two weeks only, beginning with March 11. The short time covered by the data submitted is its weakness, but on the other hand, data obtained during February and March from cows that came fresh in the fall, will be found to give fair average results and is really of more value than that obtained when cows are fresh. Fortunately it so happened that from the time that stall feeding began in the autumn, until the fifth day of November, 1894, the cows received the same ration that they did from February 11 to April 21, 1895. Beginning with the 5th of November and ending with the 18th, no grain other than ground wheat was fed. From November 19th until February 10th, inclusive, the herd was fed on fixed ration, nothing being fed ad lib. The object of the experiment was to compare wheat with barley and corn (maize). The following table gives the daily average dry matter and nutrients consumed by each cow and the daily average yield of butter fat, including all the cows employed in the experiment.

Table XI.—Giving the Daily Average of Dry Matter and Nutrients Consumed and Milk and Butter Fat Fielded from Nov. 19, 1894, to Feb. 10, 1895.

NAME	Dry Matter	DIGESTIBLE			AV. DAILY YIELD		
		Protein	C. H.	Fat	Milk	Per Cent Fat	Butter Fat
Betty .....	20.53	1.70	10.98	.45	10.03	6.7	.672
Dora .....	22.53	1.87	12.08	.49	15.02	6.3	.949
Beckley ....	20.08	1.63	10.72	.43	13.44	5.6	.761
Tricksey ...	20.53	1.70	10.98	.45	16.87	4.9	.825
Houston ...	23.23	1.98	12.44	.51	25.00	5.6	1.406
Sweet B. ...	26.91	2.25	14.50	.58	30.81	4.8	1.490
Olive .....	20.08	1.63	10.72	.43	27.26	3.8	1.050
Topsy .....	31.49	2.64	16.92	.69	44.39	3.7	1.656
Lou .....	26.22	2.14	14.10	.55	38.01	3.7	1.410
Quidee .....	23.29	1.90	12.42	.50	25.55	3.5	.908
Lydia .....	28.34	2.39	15.22	.62	32.02	3.4	1.087
Countess ...	28.37	2.38	15.28	.61	45.27	2.4	1.094
Average .	24.30	2.01	12.03	.53	26.96	4.1	1.109

The cows received rations ranging in dry matter from 20.08 pounds to 31.49 pounds and averaged 24.30 pounds, being practically the average given by the feeding standards, though none of the standards were used in making up the rations, the cows' feeding capacity being the only guide. The protein provided ranged from 1.67 pounds to 2.64 pounds and averaged 2.01 pounds, and judging from the uniformity of the flow of milk, the rations provided the nutrients needed in every case. Had the cows been fed the amount of protein prescribed by the Wloff-Lehmann standard it would have required a daily average of 2.88 pounds. The carbohydrates and ether extract provided by the rations are also very near the amount fixed by the feeding standards. The concentrates in the rations were for half the time, 6 parts spring wheat bran, 7 parts of ground spring wheat and 1 part linseed meal, and half the time 6 parts bran, 4 of barley meal and 3 of corn (maize) meal. The roughage was composed of 16 parts timothy hay and 10 parts roots. The ration was fed in the proportion of 14 pounds of grain to 16 pounds of hay and 10 pounds of roots. The nutritive ration of the wheat ration was 1:6.7, while the barley-corn ration

had a nutritive ration 1:7.3, and since the cows yielded 25 pounds more milk when fed on the ration containing the least protein it follows that when the cows were on the wheat ration they received more protein than they needed and that 2.01 pounds of protein daily was more than was actually needed when they gave 26.96 pounds of milk daily, testing 4.1 per cent fat. The cow Betty aborted in the summer and Dora was as near the close of her period of lactation and Beckley, Tricksey and Quidee were heifers.

**Table XII.—Giving Weight of Cows, Protein in Daily Ration, Yield of Milk, Per Cent Fat and Protein to One Pound of Milk from November 19, 1894, to February 10, 1895—84 Days.**

NAME	Weight	Protein Daily	Protein for Mainten- ance	Protein for Product	Yield of Milk	Per Cent Fat	Protein to 1 lb. Milk
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.
Betty .....	870	1.70	.61	1.09	10.03	6.7	.109
Dora .....	877	1.87	.61	1.25	15.02	6.1	.083
Beckley .....	839	1.63	.59	1.04	13.44	5.6	.077
Tricksey .....	733	1.70	.51	1.19	16.78	4.9	.071
Houston .....	918	1.98	.64	1.34	25.00	5.6	.053
Sweet B. ....	1063	2.25	.74	1.51	30.81	4.8	.049
Olive .....	794	1.63	.55	1.08	27.26	3.	.039
Topsy .....	1170	2.64	.82	1.82	44.39	3.7	.041
Lou .....	1143	2.14	.80	1.34	38.01	3.7	.035
Quidee .....	830	1.90	.58	1.82	25.55	3.5	.045
Lydia .....	1048	2.39	.73	1.66	32.02	3.4	.052
Countess .....	1169	2.38	.82	1.56	45.27	2.4	.034
Average ....	954	2.01	.66	1.35	26.96	4.1	.050
*Average ...	970	2.06	.68	1.38	29.85	3.9	.046

\* Without Betty and Dora.

The foregoing table gives the average weight of each cow during the experiment, the amount of protein consumed by each daily, the calculated amount needed daily for maintenance of body, the amount of protein available daily for production, the milk yielded by each, the average per cent fat and the amount of protein to a pound of milk. It will be seen that only the two cows, Betty and Dora, used protein in excess of the Wolff-Lehmann standard, while the two heifers, Beckley and Tricksey,

used nearly as much as is given in the feeding standard referred to, but it is probable that they would have done as well if less protein had been fed. But including them in the general average, we find that the cows required .05 of a pound of available protein to a pound of milk yielded and by leaving Betty and Dora out, the average amount of protein provided daily was 2.06 pounds, the average daily yield of milk 29.85 pounds testing 3.9 per cent fat and that the herd returned a pound of milk to .046 of protein, being 56.79 per cent of the amount prescribed in the standard.

**Table XIII.—Giving the Daily Average of Dry Matter and Nutrients Consumed and Milk and Butter Fat Yielded from Feb. 11 to April 21, 1895.**

Name of Cow	Dry Matter	DIGESTIBLES			AVERAGE DAILY YIELD		
		Protein	Carbo-hydrates	Fat	Milk	Per Cent Fat	Butter Fat
Beckley ...	21.19	1.68	11.10	.51	13.17	5.59	.736
Countess ..	29.22	2.40	15.50	.72	41.80	2.53	1.061
Houston ...	25.24	2.14	13.35	.64	24.88	5.38	1.349
Lou .....	27.00	2.21	14.10	.67	31.46	3.64	1.154
Olive .....	21.15	1.67	11.12	.51	21.20	4.12	.884
Reddy .....	20.94	1.69	11.01	.51	14.49	5.21	.755
Belle .....	20.56	1.76	10.89	.50	19.38	4.14	.803
Lydia .....	27.57	2.26	14.49	.68	27.93	3.57	.999
Quidee ....	22.73	1.85	11.94	.55	25.81	3.49	.902
Sweet B. ..	27.00	2.21	14.21	.67	26.09	5.28	1.379
Topsy .....	31.93	2.59	16.79	.78	40.82	3.69	1.492
Tricksey ..	19.61	1.56	10.33	.47	15.73	5.34	.840
Average .	24.51	2.00	12.90	.60	25.23	4.07	1.029

Immediately after the close of the experiment referred to, the herd of cows started on an experiment comparing timothy with prairie hay, and it so happened that in this experiment, as in the one preceding it, the rations were arranged without regard to the feeding standard in common use. The cows, Betty and Dora, were not employed in this experiment for

reasons stated, but the two-year-old heifer Reddy, that calved on the 19th of December, 1894, and the cow Belle, that was added to the list, were used in addition to those listed in the experiment comparing corn (maize) and barley with wheat. The ration was constant as regards the grain mixture and the ration of grain to roughage. The grain was composed of 6 parts of spring wheat bran, 2 parts ground corn (maize), 5 parts ground spring wheat and 1 part cotton seed meal. The coarse feed was corn (maize) silage and timothy hay fed by weight in the following proportions: 14 parts each of the grain mixture and silage and 18 parts hay. The cows were fed to their full limit. Upon examination of the table it will be seen that they consumed on an average 24.51 pounds of dry matter containing of digestible nutrients 2 pounds, of protein ( $N \times 6.25$ ), 12.90 carbohydrates and .6 of ether extract. That they gave on an average 25.23 pounds of milk testing 4.07 per cent fat. Tables XI and XIII show a remarkable uniformity in the flow of milk during the entire winter. It is the more remarkable when it is considered that these two experiments were preceded by one, confining the cows to a grain ration composed wholly of ground wheat which provided less protein than did the rations fed in the experiment under review. The yield of the herd was far above the average and the fact that it could give its maximum yield with a daily protein supply of only 2 pounds, indicates very clearly that cows of only ordinary dairy capacity get ample supply of protein from the ordinary feeds grown on the farm, and that concentrates are valuable chiefly because they have less bulk.

The following table gives the average weights of the cows, the average daily protein supply, the calculated amount of protein needed for body maintenance, taking the generally accepted factor of .7 of a pound per 1,000 pounds live weight, the amount of protein each cow had daily available for milk production, the yield of milk and per cent fat and the amount of available protein to 1 pound of milk.

Table XIV.—Giving Weight of Cows, Protein in Daily Rations, Yield of Milk, Per Cent Fat and Protein to One Pound of Milk, from February 11 to April 21, 1895—70 Days.

NAME	Weight	Protein Daily	Protein for Maintenance	Protein for Product	Yield of Milk	Per Cent Fat	Protein to 1 lb. of Milk
Beckley .....	857	1.68	.60	1.08	13.17	5.6	.082
Reddy .....	769	1.69	.54	1.15	14.49	5.2	.075
Tricksey .....	748	1.56	.52	1.04	15.73	5.3	.066
Houston .....	906	2.14	.63	1.51	24.88	5.4	.061
Sweet B. ....	1067	2.21	.75	1.46	26.09	5.3	.056
Belle .....	951	1.76	.66	1.10	19.38	4.1	.056
Olive .....	794	1.67	.55	1.12	21.20	4.1	.053
Lou .....	1115	2.21	.78	1.43	31.46	3.7	.045
Topsy .....	1153	2.59	.81	1.78	40.82	3.7	.043
Lydia .....	1079	2.26	.75	1.51	27.93	3.6	.054
Quidee .....	875	1.85	.61	1.24	25.81	3.5	.048
Countess .....	1184	2.40	.74	1.66	41.80	2.5	.040
Average .....	958	2.00	.67	1.33	25.23	4.07	.048

During this experiment Bevkley was the only cow in the herd that received protein in excess of the amount prescribed in the Wolff-Lehmann standard, while one other heifer, Reddy, received narly as much. Both Reddy and Tricksey were heifers of about the same weight; the former received 1.69 pounds of protein while the latter received 1.56 pounds, their milk was of the same quality, but Reddy gave only 14.49 pounds daily while Tricksey gave 15.73 pounds, indicating that the former at least, received more protein than she needed for the milk she was giving. During the 70 days, Reddy gained in body weight 38 pounds, while Tricksey gained 21 pounds. The heifers named and Quidee were making normal growth and it may be that the excess of protein fed was used in building the body. By comparing the quality of the milk yielded by each cow as indicated in the column of per cent fat, with the amount of protein charged to a pound of milk, we again find that of the mature cows working under normal condition, the cow that yielded milk containing 5.4 per cent fat used .061 of a pound of available protein to a pound of milk yielded, that the cows that yielded milk containing 3.7 per cent fat are

charged with .044 of a pound of available protein to a pound of milk yielded, while the cow that gave milk containing 2.5 per cent fat received .04 of a pound of available protein to each pound of milk yielded and that the herd received on an average 2 pounds of protein daily, yielded 25.23 pounds of milk, testing 4.07 per cent fat, being 22 points above average quality, and stands charged with .048 of available protein to a pound of milk yielded, being about 60 per cent of the amount given in the Wolff-Lehmann standard. Of the 12 cows employed in this work 4 were heifers—three with first calf and one having aborted with the second. The cow Belle was a stranger in the herd, was in milk when she came to the herd and was at times fed a ration varying some from that fixed for the experiment, because she showed indications of losing her appetite, and Lydia on February 11, was in a feverish condition, which caused her to shrink in milk, and her milk tested 6.4 both in the morning and evening. So the results that were obtained in this experiment met with such difficulties as ordinarily occur in the management of a herd of dairy cows. It is not claimed that the cows used or needed just the amount of protein that was provided; nor that each cow, or in fact that any cow, used just at the rate of .7 of a pound of protein daily per one thousand pounds live weight, but for the time being we used this factor because it is in common use and because after three winters' work with barren cows on food of maintenance we consider it a safe one to apply to cows when yielding milk and growing a foetus. Taking the average amount of available protein charged to the cows in the two experiments reviewed, as a basis, it suggests that an allowance of .046 of a pound of available protein to a pound of milk of average quality yielded, is sufficient to maintain the flow, and by increasing or decreasing this allowance by .004 of a pound of protein for every .5 of one per cent of increase or decrease in the test of the milk, the ration will be adjusted to the needs of cows giving the various grades of milk. Milk testing 3.85 per cent fat is fixed as the standard average, and a cow giving that grade needs .046 of a pound of available protein to each pound of milk she yields.

Adjourned until 1:15 p. m.



***Thursday Afternoon, January 8th, 1903***

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**FIRST STEPS IN THE HANDLING OF MILK.**

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By Dr. C. E. Marshall, Agricultural College of Michigan.

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Thirty years ago little would have been thought of the handling of milk by a bacteriologist, although he was fully cognizant at that time of the relation existing between bacteria and some of the changes taking place in milk; in fact, he had not reached that degree in his development that would enable him to take an economic view of this most practical combined dairy and bacteriological question. The bacteriology of the dairy was in reality very slow in its development, mainly through neglect and now is consequently much behind many other branches of this same subject, although it is no less prominent.

Reviewing briefly a few stages of bacteriological growth, because they are pertinent to our subject, we find that each of its stages marks an epoch in some professional or industrial history. In medicine it is well understood how bacteriology has equipped the surgeon for his operations and the sanitarian for the prevention and fighting of contagious diseases. The surgeon in 1860 knew comparatively little concerning the meaning of the operations which he performed. This is clearly manifested by the great mortality resulting from his operations. The sanitarian was so crude that he made futile attempts in fighting disease because he knew not by what avenues the agents of contagious disease traveled, nor did he know how to destroy these agents successfully when he suspected their presence.

The work initiated by Pasteur, and the first work of the kind done, was that which was destined to promote industries. We are all acquainted with Pasteur's fight against disease as represented by the silk worm disease, rabies, anthrax, all of which yielded a thousand-fold reward for his efforts and cost of experiments. Whether we look for instance at the disease of the silk worm, at anthrax, which attacks cattle, sheep and other domestic animals, to his studies of vinegar, of wine or of beer, it matters not, for we find wherever his touch occurred there followed results which redounded to the benefit of mankind.

I am especially anxious to call your attention to a brief resume of the last, beer fermentations or the development of breweries, not that I commend the product, but that this resume may give you ideas and a working basis. It is a history which ought to yield many useful lessons to dairymen. Pasteur found that frequently diseases occurred in beer which would cause thousands of dollars loss to the manufacturers. These diseases would creep in stealthily and before the manufacturer could check them, his whole product would be a total loss. Pasteur was able to overcome a few of these diseases by pointing out some of the causes and counteracting them by rational and scientific methods. However much Pasteur may have done to help out the manufacturers of beer by his various ingenious devices and thus saving millions for France, it was not until Hansen came upon the scene and demonstrated in great detail the possibilities of diseases in beer as well as the possibilities of producing a product as was desired, a product resulting from absolute control, from an absolute knowledge of the fermentation, and an absolute purity of the yeast plant, the agent of this fermentation. Being able to isolate the yeast plant in its pure form, he was able to introduce it into the work, thus producing the correct and desired fermentations of beer and was further able, and it seems to me that this is the most important feature, to eliminate all unhealthful or off fermentations or diseases to which beer is heir.

To learn from Hansen of his struggles with the proprietor of the Carlsberg brewery, of his efforts to persuade this proprietor to undertake some of the ideas he had fully demonstrated in the laboratory, is only to convince oneself of the slowness with which scientific knowledge usually permeates the practical mind of the practical man. The proprietor finally permitted him to try in a small way some of his experiments in his

brewery. He soon demonstrated to the satisfaction of the proprietor that he was right in so far as he was allowed to carry out his ideas. Little by little Hansen advanced, and it was only a very few years until the brewery was practically placed under Hansen's control so far as the execution of his ideas and methods was concerned. This brewery was the germ from which the present scientific method of brewing sprung.

Brewing today is quite a different thing from brewing of twenty years ago, for then it was a hap-hazard business, today it is absolutely safe and the results can be determined before hand; then the brewery was a filthy establishment, today it is as clean and cleaner than most bacteriological laboratories, in fact some of them are more appropriately likened to a surgical operating room. The same precision that is used in the laboratory is used in these breweries. Cleanliness to them is the secret of success if we link it with the knowledge which has come from Pasteur and Hansen. I go into this detailed account not simply to acquaint you very briefly with the past industrial development but mainly to have you depict in your own mind a picture not dissimilar in many of its phases from what you see in your daily dairy vocation. Your profession, if anything, is more complicated. There are more questions to consider, more problems to solve. You are not perhaps so well able to control, yet, in the face of all this, you will always find room for advancement, food for thought—stimulation, ideas to carry into action, from the picture which the manufacturing of beer has given to you. Most breweries know the value of a scientific foundation; most dairymen do not fully appreciate it.

Milk is an unstable body. Apply to it physical or chemical agents and you immediately change its nature. Milk after being exposed to the air is not milk as it exists in the udder of the cow. Milk after it has set twelve hours is not the same as milk which is just freshly drawn. We, therefore, have a product far more susceptible to change than the product which the brewer works with. More than that, milk is open to contamination from diverse sources which are far more difficult to influence than those sources which the brewer has to contend with. While we are proving dairying more difficult, we do not necessarily admit that methods cannot be improved, that we cannot have a better milk, that we cannot secure a better product than we have at the present time. When they

used to manufacture beer in years gone by, they frequently obtained as good beer as they do at the present time, but they were never so sure of what they were going to get. This is equally true of our dairy products. We never know just what the result is going to be; we never feel certain that we are going to get a high grade product from the milk. Even in Michigan we produce Elgin butter. It commands the highest prices, but this butter is not uniform. If it were uniform it would not be necessary to have butter shows where prizes are offered for the best butter. To my mind it is possible to secure a higher grade of butter, but it means an evolution; it is not going to take place in a single decade. It means a process of education, or growth, where all those who are interested in the manufacture of butter will be able to take hold with intelligence, with will or determination and with pride, to manufacture such a product. At present we are far from it and there are reasons why this condition of affairs exists.

The producers of milk in general are not sufficiently acquainted with milk itself and with those agents which tend to influence milk. They, therefore, are not intelligently posted in those methods which will produce a satisfactory milk. Also they are claiming that the consumers will not pay for the extra labor entailed in the production of a first grade milk. Farther, too, there is too little comprehensive knowledge of the methods used in the manufacture of milk products. You may chide me for making these remarks, but in general I am right in saying that they are true. You know that every farmer cannot produce milk at a profit. You know that one farmer will make six to eight per cent on his investment while his neighbor, living practically under the same conditions, will lose as much or even more. What is the difference? One is an intelligent dairyman and the other is not. One is an expert and the other is not. No matter where you go or what profession you examine, this same condition exists. It is the man who knows, who has the energy to push his knowledge. So I believe that he who is able to know dairying from A to Z will be the man who will succeed in dairying. He may be depended upon to develop dairy science and dairy art, for he will appreciate the value of it and the relation of such to his work. I do not believe that it is worth while to try to educate a man who is opposed to that education, whether it is in college or whether that education comes through self-

study. The best way to cure a balky horse is to get rid of him. Time is too valuable to spend in efforts to correct him.

Let us consider more in detail some of "The First Steps in the Handling of Milk," as we regard them from the scientific side. Dr. Russell has given you, I have no doubt, although I did not hear him, a most thorough exposition of the contamination of milk. It is not necessary, therefore, that I should enter into a discussion of this phase, although it is so closely related to my subject. The points, therefore, which I desire to make and which will serve as heads for my subsequent discussions will be.

1. The Germ Content of Milk.
2. The Germicidal Constituents of Milk.
3. The Gas Content of Milk.
4. The Temperature of Milk.

1. The Germ Content of Milk.—For many years it was supposed that milk in the udder was absolutely free from bacteria. The supposition being that it existed in a sterile form as most other fluids and secretions of the body. This notion prevailed because of the fact that many were able to secure samples of milk which kept indefinitely so far as appearances were concerned. Doubtless in many cases no tests were made of the milk to ascertain whether any micro-organisms were present or not. The conclusions, therefore, concerning the sterility of milk in the udder was a very natural conclusion. It is an easy matter to secure milk from the udder of a cow which will to all appearance keep very satisfactorily, and, in my own experience, fifty per cent of the samples taken under sterile conditions from the udder will not undergo a change of any kind unless it is a slight deposition of the suspended constituents in the milk. More recent work, however, has demonstrated that micro-organisms are quite commonly found in milk as milk exists in the udder, sometimes in quite large numbers, but not all of these micro-organisms are capable of producing apparent changes. Some of them are obnoxious, however, and probably lead to undesirable fermentations.

As we look upon these in a practical light the number of micro-organisms usually found in the milk of the udder, even though exposed

to the air, is so comparatively small that they are not necessarily going to create trouble often in the after manipulations of the milk, provided those manipulations are such as will tend either to hold these bacteria in check or to overcome them by one method or another. Exceptions to this must be taken, whenever disease producing bacteria or pathogenic bacteria are present, since, of course, we all recognize the possibility of transmission. But, in this article we are not considering the matter of disease because our mind is occupied with matters which are closely related to milk and its products. We may, therefore, assume that the bacteria which exists in the udder of a cow will not cause any serious trouble if a little care is exercised.

The germ content of milk immediately after milking is usually greatly increased and this increase is exceedingly variable. This doubtless has been brought out by Dr. Russell in his paper on the "Contamination of Milk," and he probably stated the sources of these bacteria which find their way into milk. It is desirable to keep the number of bacteria down to its minimum, otherwise it will be exceedingly difficult to control the bacteria which have been introduced by the various methods available, even by starters. Different devices or different methods may be employed to reduce the number of bacteria and to keep them within certain limits and will render the dairyman inestimable service in his control of the milk. There might be a difference of opinion as to the most desirable method to keep the number of bacteria down, but there can be no difference of opinion as to the desirability of diminishing the number, since, as we shall see later, the activity of the germicidal agents is largely influenced by the number of bacteria present.

2. Germicidal Constituents of Milk.—Intimately associated with the germ content of milk are the germicidal constituents, for one depends upon the other for its manifestations. Considerable study and attention have been given to these substances as they exist in nearly all the body tissues and body secretions, of late year, inasmuch as they are associated with susceptibility to and immunity against disease. It is therefore natural that we should find these agents existing in the milk and attribute to them their proper significance. That they exist can be easily shown by simply ascertaining the number of bacteria in the milk at the time of milking and each hour afterward for about twelve hours. It will be found

that the number we find at first will be gradually diminished for a few hours, when there will be a gradual increase until a certain point is reached, at which the increase becomes exceedingly rapid.

It may, perhaps, appear peculiar that we should find bacteria in the milk while these germicidal constituents are present. It should be understood that germicidal constituents in the secretions of the body or in the body tissues do not necessarily act in the same way upon all kinds of bacteria. It might be, therefore, that the small number of bacteria which exist in the udder are not necessarily attacked by these germicidal constituents or that the bacteria do not increase and are only held in check, or it may be possible that the germicidal constituents are, many times, so small in quantity that there is no appreciable action upon the bacteria. It is true that these germicidal agents vary in their intensities.

If milk is studied under various conditions, it will be found, further, that the number of bacteria has a marked bearing upon the manifestations of the germicidal agents. If I am able to interpret the results of experiments accurately, I should say that the smaller the number of bacteria, the greater the germicidal activity, or more strictly speaking, the greater the proportion of the bacteria destroyer. It does, therefore, make a difference whether you favor the conditions which control germicidal action or not. However, if milk is allowed to stand, and it does not contain too many bacteria, it will be noticed that the germicidal action will continue for from six to twelve hours and the number of bacteria does not greatly increase over the number existing immediately after milking, until the end of this time has been nearly reached, then the number rises very rapidly. This is also true with the germicidal constituents of the body. Time destroys these germicidal constituents after removal from the body. It is a generally recognized fact, too, in case of other secretions of the body other than milk, that these germicidal constituents will take care of only a limited number of bacteria. It is therefore advantageous to favor the actions of these germicidal constituents. We may assume if it were not for this germicidal factor in milk, it would be barely possible that many changes would take place even in milk before it leaves the udder.

3. The Gas Content of Milk.—The elimination of gases from the milk does not necessarily mean that the milk has been rendered more palatable or more healthful, but it does indicate that with the elimination

of gases, changes take place which do influence the milk one way or the other. Of course it is easily understood that the gases which have been determined can have only indirectly a bearing upon the fermentations of the milk. The presence of carbon dioxide, of oxygen, or residual gases, called usually nitrogen, signifies nothing especially so far as these gases themselves are involved, but, when we find that the amount of carbon dioxide is greatly diminished as we draw the milk from the udder as we pass it over the aerator, in fact, as we agitate it more or less in the presence of air; farther, as we note at the beginning, the milk in the udder contains no trace of oxygen but with the milking process the amount of oxygen greatly increases, as when the milk is treated as recited, under carbon dioxide, the oxygen continues to increase in amount; and, too, as we notice the changes in the amount of the residual gas, we can readily understand that there are marked alterations going on in the milk as it passes through the various manipulations of the dairy.

It is not desirable to look upon aeration as simply a process which means the elimination of animal odor, which may be regarded as a mooted question or mooted process—it were better that aeration should be looked upon as a means of gaseous interchange between the milk and the air. Perhaps it is desirable to get rid of animal odors or taints, resulting from physiological process or disease, yet to my mind the most significant and most practical side of aeration is the fact that obnoxious gases which permeate the air are as rapidly taken in or absorbed by the milk as the oxygen and the nitrogen of the air and these gases act as substitutes for the carbon dioxide and animal odor which in turn leave the milk and pass into the air. This free interchange of gases, i. e., the gases of the air passing into the milk and the gases of the milk passing into the air, results from the desire of Nature's law to create an equilibrium of bases; therefore, we are safe in saying that any odor prevailing in the stable, in the dairy, or anywhere where milk is exposed, is quite likely to pass into the milk, consequently milking should be carried out in a pure air and milk should not stand in an impure atmosphere. Aeration should be conducted where there are no contaminating gases.

Another point concerning aeration which is of practical consequence is the matter of time in aerating and temperature of aerating. If the same milk is colled down to a low temperature, the animal odor disappears



apparently Again heat that milk to the temperature of the body and the animal odor will reappear. This demonstrates, therefore, that the animal odor was not eliminated, but that the cooling process caused it to apparently disappear. It is also true that if we desire to obtain the gases from milk, these gases can most easily be secured by warming the milk. In fact, if we boil the milk, we can drive off most of the gases. Therefore, if we were going to eliminate gases from the milk, it is far more desirable to aerate when the milk is warm and it would not be a logical method by any means to combine aeration and cooling and make them a simultaneous process. The time, therefore, for aerating is immediately after milking and before cooling.

It may be said in passing, that although it is very difficult to demonstrate, it is probably true that the presence of a considerable amount of carbon dioxide in the milk influences the character of the fermentation. It seems to be an established fact that where only traces of oxygen exist poisons are more likely to be formed in food substances. It is noteworthy in connection with milk that there are several cases of poisoning on record where the milk had not been aerated, had been shut up in cans, the air excluded, the temperature high, and all those conditions present which are usually regarded as unfavorable. To illustrate this more thoroughly, you shut up a ten gallon can of milk, leaving only a small air space at the top, it will be found that soon all the oxygen in that air space is rapidly consumed and carbon dioxide given off. It follows, under such conditions that we have established the most favorable environment for the development of an aerobic bacteria, which would not grow rapidly if they were transferred to an abundant supply of oxygen, lower temperatures, and other circumstances which we usually find where milk is properly handled.

We may claim, therefore, for aeration considerable of practical import. It fosters the desirable fermentations by creating a larger supply of oxygen and by reducing the amount of carbon dioxide. It eliminates those gases which are not considered desirable and which are frequently mentioned as animal odors, taints, etc. It is quite likely that it checks the development of those micro-organisms which produce poisons.

4. The Temperature of Milk.—The value of cooling milk is doubtless already known to you all. It is not especially necessary that I should

enlarge very much upon this point for you have already read much and heard much concerning it, and probably are familiar with its relation to milk. However, I do not want to overlook this important point if it is possible to give you a more comprehensive view of the cooling and keeping cool of milk. There can be no question that milk should be cooled as soon as it is feasible after the milk leaves the udder, but the cooling should follow aeration. The lower the temperature to which milk may be brought, the better for ordinary milks, but if it is desirable, in the case of a comparatively pure milk, to secure the best germicidal results, it is better that the milk be held at about 70 degrees Fahrenheit. In this matter of cooling, therefore, consideration must be given to the possible germicidal activity of the milk, but this factor may not be regarded with ordinary milks, milks which are highly polluted.

It is understood farther that cooling simply checks the development of bacteria the same as cool nights in summer checks the growth of corn. The cold does not kill the bacteria, they will grow as rapidly after the temperature is again raised as if they had not been chilled at all. In order to have the cooling effective, therefore, it is absolutely required that the temperature be kept down until the milk is used for its various purposes. Even the warming up of milk after it has been once cooled will hasten the possible changes in it. For instance, if the milk is to be passed through a separator, it is better that it pass through before it has been cooled down immediately after milking, than to first cool it down, then warm it before passing through the separator. Not only is it more desirable from a bacteriological standpoint, but it is a more economical process, for heating the milk for the separator is always an additional process and is expensive.

The whole matter of cooling is founded upon the fact that cold preserves by inhibiting the growth of bacteria, no matter whether you use it in connection with milk or any of its products, the influence is practically the same. There may be something said in relation to the different temperatures to which milk is cooled, because with the lowering of the milk even ten degrees the change which occurs is probably different than that which would have occurred had not the milk been lowered that amount. A new set of micro-organisms is probably at work, for usually a range of ten degrees limits the most suitable temperatures in which any micro-

organism develops rapidly. Germs which grow very readily between eighty and ninety degrees, do not grow so readily between forty and fifty, and on the other hand, there are germs which will thrive quite readily between forty and fifty which will not grow readily between eighty and ninety degrees. It may be said in general that most germs find their best temperature limits between seventy and one hundred degrees. The matter of cooling, therefore, cannot be emphasized too greatly, its significance is far reaching. There is too little attention given to it by dairymen, simply because they do not realize its value.

I should like to leave you with a few concise statements which I am confident are essential to dairy progress and success.

1. To obtain the highest grade of milk for consumption, for butter, or for cheese, absolute control of the milk is necessary.
2. This control is secured only through proper manipulation of the milk immediately after it leaves the udder.
3. Cleanliness or the minimum of germ content, the greatest possible interchange of gases in pure air, and cooling with continued low temperature till used, make this control possible.
4. Starters or other devices unless it is pasteurization will have little influence upon milk which has not been subject to the above treatment.
5. Milk under control is susceptible to such methods and handling as the operator may see fit to employ.

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## METHODS OF CORN BREEDING.

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By Cyril George Hopkins, Ph. D., Professor of Agronomy in the Agricultural College and Chief in Agronomy and Chemistry in the Agricultural Experiment Station.

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It is a well established fact that there now exist markets and demands for different kinds of corn.

The price of corn varies, say, from  $\frac{1}{2}$  cent to 1 cent per pound.

The cost of protein in the principal stock feeding states varies from 3 to 5 cents per pound. In other words, the protein is several times more valuable per pound than corn itself. Consequently, stock feeders want more protein in corn. (Very possibly the feeders in the southern states want more carbohydrates to supplement their present more abundant supplies of nitrogenous food stuffs.)

The price of corn starch varies from 2 or 3 cents to 5 or even 10 cents per pound, depending upon the wholesale or retail nature of the sale. The manufacturers of starch and glucose sugar, glucose-syrup, and other products made from starch want more starch in corn.

In its own publication a large commercial concern, which uses enormous quantities of corn, makes the following statements:

"A bushel of ordinary corn, weighing 56 pounds, contains about 4½ pounds of germ, 36 pounds of dry starch, 7 pounds of gluten, and five pounds of bran or hull, the balance in weight being made up of water, soluble matter, etc. The value of the germ lies in the fact that it contains over 40 per cent of corn oil, worth, say, 5 cents per pound, while the starch is worth 1½ cents, the gluten 1 cent, and the hull about ½ cent per pound.

"It can readily be seen that a variety of corn containing, say one pound more oil per bushel would be in large demand.

"Farmers throughout the country do well to communicate with their respective agricultural experiment stations and secure their co-operation along these lines."

These are statements and suggestions which should, and do, attract the attention of experiment station men. They are made by the Glucose Sugar Refining Company, of Chicago, a company which purchases and uses, in its six factories, about fifty million bushels of corn annually. According to these statements, if the oil of corn could be increased one pound per bushel, the actual value of the corn for glucose factories would be increased 5 cents per bushel; and the President of the Glucose Sugar Refining Company has personally assured the writer that his company would be glad to pay a higher price for high oil corn whenever it can be furnished in large quantities. The increase of five cents per bushel on fifty million bushels would add \$2,500,000 to the value of the corn purchased by this one company each year. The glucose factories are now

extracting the oil from all the corn they use and are unable to supply the market demand for corn oil. On the other hand, to these manufacturers, protein is a cheap by-product and consequently they want less protein in corn.

Corn with a lower oil content is desired as a feed for bacon hogs, especially for our export trade, very extensive and thorough investigations conducted in Germany and Canada having proved conclusively that ordinary corn contains too much oil for the production of the hard, firm bacon which is demanded in the markets of Great Britain and Continental Europe.

The methods of corn breeding devised by the Illinois Experiment Station and now used not only by us, but also by the Illinois Seed Corn Breeders' Association, and to some extent, by other Experiment Stations and other corn breeders, have for their object the improvement of corn—in yield and in quality. In the main the methods are now the same as we have employed for the past six years, and they have given results which enable us to assert with confidence that by these methods corn can be improved in a very marked degree and for many different purposes. The yield of corn can be increased, and the chemical composition of the kernel can be changed as may be desired, either to increase or to decrease the protein, the oil, or the starch.

Following is a brief description of the methods of corn breeding which we practice and which we have recommended to others.

#### Physical Selection of Seed Corn.

The most perfect ears obtainable of the variety of corn which it is desired to breed should be selected. These ears should conform to the desirable standards of this variety and should possess the principal properties which belong to perfect ears of corn, so far as they are known and as completely as it is possible to secure them. These physical characteristics and properties include the length, circumference, and shape of the ear and of the cob; the number of rows of kernels and the number of kernels in the row; the weight and color of the bran and of the cob; and the size and shape of the kernels. In making this selection the breeder

may have in his mind a perfect ear of corn and make the physical selection of seed ears by simple inspection, or he may make absolute counts and measurement and reduce the physical selection almost to an exact or mathematical basis.

In this connection let me suggest that there is some danger of corn breeders making too much of what might be called fancy points in selecting seed ears. We should learn the facts which are facts and not base our selections too much upon mere ideas and opinions. For example, it is not known that ears whose tips are well filled and capped with kernels are the best seed ears. Indeed it is not improbable that the selection of such seed ears will cause the production of shorter ears and a reduced yield per acre. It is true that the percentage of shelled corn from a given ear is the greater, the greater the proportion of corn to the cob, but our interest in that percentage is very slight compared to that of yield per acre, and perhaps for the greatest possible yield of shelled corn per acre it requires that the ears shall have good sized cobs. Possibly the corn which shall ultimately surpass all others for yield per acre will have tapering and not cylindrical ears. These are some of the points regarding which men have some ideas and opinions, but as yet we have no definite facts, and we shall need several years more to obtain absolute knowledge regarding some of these points. Let us base our selections of seed corn first upon known facts and performance records, and secondly upon what one may call his "type" of corn.

#### **Chemical Selection by Mechanical Examination.**

The selection of seed ears for improved chemical composition by mechanical examination of the kernels is not only of much assistance to the chemist in enabling him to reduce greatly the chemical work involved in seed corn selection, but it is of the greatest practical value to the ordinary seed corn grower who is trying to improve his seed corn with very limited service, if any, from the analytical chemist. This chemical selection of seed ears by mechanical examination, as well as by chemical analysis (which is described below), is based upon two facts:

1. That the ear of corn is approximately uniform throughout in the chemical composition of its kernels.

2. That there is a wide variation in the chemical composition of different ears, even of the same variety of corn. These two facts are well illustrated in Table 1.

Table 1.—Protein in Single Kernels.

	Ear A, protein, per cent.	Ear B, protein, per cent.	Ear C, protein, per cent.	Ear D, protein, per cent.
Kernel No. 1 .....	12.46	11.53	7.45	8.72
Kernel No. 2 .....	12.54	12.32	7.54	8.41
Kernel No. 3 .....	12.44	12.19	7.69	8.73
Kernel No. 4 .....	12.50	12.54	7.47	8.31
Kernel No. 5 .....	12.30	12.14	7.74	8.02
Kernel No. 6 .....	12.49	12.95	8.70	8.76
Kernel No. 7 .....	12.50	12.84	8.46	8.89
Kernel No. 8 .....	12.14	*	8.69	9.02
Kernel No. 9 .....	12.14	12.04	8.86	8.96
Kernel No. 10 .....	12.71	12.75	8.10	8.89

\* Determination lost by accident.

It will be observed that, while there are, of course, small differences among the different kernels of the same ear, yet each ear has an individuality as a whole, the difference in composition between different ears being much more marked than between different kernels of the same ear.

The uniformity of the individual ear makes it possible to estimate or to determine the composition of the corn by the examination or analysis of a few kernels. The remainder of the kernels on the ear may then be planted if desired. The wide variation in the composition between different ears furnishes a starting point for the selection of seed in any of the several different lines of desired improvement.

The methods of making a chemical selection of ears of seed corn by a simple mechanical examination of the kernels is based upon the fact that the kernel of corn is not homogenous in structure, but consists of several distinct and readily observable parts of markedly different chemical com-

position. A side from the hull which surrounds the kernel, there are three principal parts in a grain of corn:

1. The darker colored and rather hard and horny layer lying next to the hull, principally in the edges and toward the tip end of the kernel where it is about 3 millimeters, or  $\frac{1}{8}$  of an inch, in thickness.

2. The white, starchy-appearing part occupying the crown end of the kernel and usually also immediately surrounding, or partially surrounding, the germ.

3. The germ itself which occupies the central part of the kernel toward the tip end.

These different parts of the corn kernel can be readily recognized by merely dissecting a single kernel with a pocket knife, and it may be added that this is the only instrument needed by anybody in making a chemical selection of seed corn by mechanical examination.

The horny layer which usually constitutes about 65 per cent of the corn kernel contains a large proportion of the total protein in the kernel.

The white, starchy part constitutes about 20 per cent of the whole kernel, and contains a small proportion of the total protein. The germ constitutes only about 10 per cent of the corn kernel, but, while it is rich in protein, it also contains more than 85 per cent of the total oil content of the whole kernel, the remainder of the oil being distributed in all of the other parts.

By keeping in mind that the horny layer is large in proportion and also quite rich in protein and that the germ, although rather small in proportion is very rich in protein, so that these two parts contain a very large proportion of the total protein in the corn kernel, it will be readily seen that by selecting ears whose kernels contain more than the average proportion of germ and horny layer we are really selecting ears which are above the average in their protein content. As a matter of fact, the method is even more simple than this, because the white starchy part is approximately the complement of, and varies inversely as, the sum of the other constituents; and to pick out seed corn of high protein content it is only necessary to select those ears whose kernels show a relatively small proportion of the white, starchy part surrounding the germ.



As more than 85 per cent of the oil in the kernel is contained in the germ, it follows that ears of corn are relatively high or low in their oil content, according as their kernels have a larger or smaller proportion of germ.

In selecting seed corn by mechanical examination for improvement in composition we remove from the ear a few average kernels; cut two or three of these kernels into cross sections and two or three other kernels into longitudinal sections and examine these sections as they are cut, usually simply with the naked eye.

If we are selecting seed ears for high protein content we save those ears whose kernels show a small proportion of the white starch immediately adjoining or surrounding the germ. If selecting corn for low protein content we look for a larger proportion of white starch surrounding the germ. Our results have shown that the white starch in this position, that is, surrounding the germ toward the tip end of the kernel, is a better index of the protein content than the starch in the crown end.

If we are selecting seed ears for high oil content we save those ears whose kernels show a large proportion of firm and solid germ; while if seed of low oil content is desired, we look for a small proportion of germ in the kernel.

It should be emphasized that it is not the absolute, but proportionate, size or quantity of germ or of white starch which serves as a guide in making these selections.

#### Chemical Selection by Chemical Analysis.

In selecting seed corn by chemical analysis we remove from the individual ear two adjacent rows of kernels as a representative sample. This sample is ground and analyzed as completely as may be necessary to enable us to decide whether the ear is suitable for seed for the particular kind of corn which it is desired to breed. Dry matter is always determined in order to reduce all other determination to the strictly uniform and comparable water-free basis. If, for example, we desire to change only the protein content, then protein is determined. If we are breeding to change both protein and the oil, then determinations of both of these constituents must be made.

For a satisfactory breeding plot, about 20 to 40 selected seed ears are required. If the breeder desires to make only physical improvement then he should select, say, 40 of the most nearly perfect ears which it is possible to pick out by inspection or by exact physical measurements. If it is desired to improve the composition or quality of the corn as well as the physical properties, then at least 200 physically perfect ears should be selected, and, from these 200 ears, the 40 ears which are most suitable as seed for the particular kind of corn which it is desired to breed should be selected, either by mechanical examination of sections of kernels, which anybody can make, or by chemical analysis, or by a combination of these two methods. In our own work we now commonly select by physical inspection or measurement the 200 ears; then, from these 200 ears, we select by mechanical examination of sections of kernels the best 50 or 100 ears, and from this lot we finally select by chemical analysis the best 20 to 40 seed ears for planting. This combination of methods effects a very satisfactory seed selection and requires only one-half as much chemical work as would be required if the method of chemical analysis alone were employed.

Table 2 shows very fairly the degree of seed improvement which may be accomplished by these different methods of selection, when breeding to change only the protein content of corn.

It may be stated that equally satisfactory results may be obtained in chemical selection by mechanical examination for securing seed ears of high or low oil content. For example, the writer has selected by mechanical examination, from a lot of 272 ears of corn, 18 ears for high oil content which averaged 5.24 per cent of oil; and, from the same lot of corn, 30 ears were selected for low oil content which averaged 4.13 per cent oil, making an average difference of 1.11 per cent of oil.

**Table 2.—Some Fair Illustrations of Actual Results Obtained in Selection of Seed Corn.**

(Protein, average per cent.-

Variety.	200 average seed ears.	50 ears selected by mechanical examination.	28 ears selected by chemical analysis	10 best seed ears.	Best single seed ear.
Boon County White..	10.57	9.72	9.36	8.84	8.69
Silver Mine .....	10.00	9.47	8.77	7.97	7.00
Leaming .....	11.96	11.36	10.79	10.08	8.82
Leaming .....	11.90	12.44	13.33	14.03	14.63
Leaming .....	11.27	11.84	12.43	13.12	14.71
Yellow Dent .....	11.14	11.64	12.11	12.55	13.24
Riley's Favorite .....	11.02	11.38	12.41	12.99	15.78
Burr's White .....	12.48*	12.88	14.36	14.87	15.71
Burr's White .....	9.20**	9.10	7.77	7.56	7.08
Leaming .....	11.26	12.14***			
Leaming .....	11.26	10.67***			

\* Average protein content of ten field rows of Burr's White after four years' breeding for high protein.

\*\* Originally from some stock of Burr's White as preceding, but bred four years for low protein.

\*\*\* Two lots of 42 ears each selected from the same lot of 200 ears for two breeding plots, high protein and low protein, the seed for which is selected by physical inspection and mechanical examination but without chemical analysis of individual ears.

If the method of mechanical examination alone is employed in making the chemical selection, then, if possible, there should be some chemical control of the work, at least until the breeder has become sufficiently skilled, or has had sufficient experience, to feel that he knows how to make a chemical selection of seed ears by mechanical examination of kernels. Such a chemical control does not involve a large amount of chemical work. In Illinois the Experiment Station offers such a chemical control to farmers who will agree to make the selection of the best possible seed, both by physical inspection of ears and mechanical examination of kernels and who will further agree to secure data and breed the corn in accordance with our directions.

This control is affected by analyzing only two samples of corn each year; one composite sample of the rejected ears, five average kernels

being taken from each ear, and one composite sample of the 20 to 40 selected seed ears, twenty average kernels being taken from each of these ears, and each of these two composite samples being properly labeled and analyzed.

One of the best selections which has yet been made by mechanical examination was accomplished last spring by a farmer who is breeding corn for higher protein content. Out of a lot of 165 ears of corn he selected 15 ears whose protein content averaged 1.48 per cent higher than that of the 150 rejected ears, as was determined by the chemical analysis of a composite sample from each of the two lots. Because of the chemical control which the Station affords him, he knows each year just how much he has accomplished.

If the purpose of breeding a kind of corn is principally to change its content of a single constituent, as to increase protein, then the selection of the best 40 ears is simple and regular by either method; but if it is desired to effect changes in the content of two constituents, as to increase the protein and to increase the oil in the same corn, then one could hardly expect to make much progress in both directions, if he relied solely upon mechanical examination of kernels for chemical selection of seed ears. Even after the chemical analyses of 100 ears have been made it requires some computation to determine which are really the best 40 ears. For example, an ear may be desirable for seed because of its high protein content, but it may not be sufficiently high in oil. In order to reduce the selection to an exact basis, we have adopted simple mathematical computations for all such cases.

For high protein and high oil in the same corn, we multiply the percentage of protein by the percentage of oil and use the product as the selection coefficient, the forty highest products designating the forty best ears.

For low protein and low oil we multiply the percentages together and use the lowest product as the selection coefficient.

For high protein and low oil in the same corn, we divide the percentage of protein by the percentage of oil and use the highest quotients as our selection coefficients.

Table 3.—Selection of Seed Corn for High Protein and High Oil.

No.Ear.	Protein in corn.	Oil in corn.	Selection coefficient.
1 .....	11.17	6.03	<b>67.30</b>
2 .....	12.66	4.90	62.00
3 .....	12.60	4.92	<b>66.89</b>
4 .....	10.85	4.55	49.80
5 .....	11.01	5.72	<b>62.97</b>
6 .....	11.50	4.77	54.81
7 .....	14.71	5.56	<b>81.75</b>
8 .....	10.07	4.73	47.62
9 .....	13.14	5.44	71.53
10 .....	10.19	5.80	59.10
11 .....	11.01	5.97	<b>65.78</b>
12 .....	10.39	4.73	49.13
13 .....	13.96	5.28	<b>73.72</b>
Average .....	11.87	5.26	62.50

For low protein and high oil we divide in the same manner, but use the lowest quotients for selecting the best ears.

Table 3 illustrates the value of this method as applied to the selection of the best seed ears for both high protein and high oil.

It will be observed that some ears which are high in only one desirable constituent (see No. 2 and No. 10) must be discarded because the selection coefficients which they give are even below the average; while other ears which may be quite low in one constituent (see No. 1 and No. 3) still furnish acceptable selection coefficients.

#### The Breeding Plot.

The 40 selected seed ears are planted in 40 separate parallel rows, one ear to a row, consequently the breeding plot should be at least 40 corn rows wide and long enough to require about three-fourths of an ear to plant a row. It is well to shell the remainder of the corn from all of the 40 ears, mix it together, and use it to plant a border several rows wide entirely around the breeding plot, to protect it, especially from foreign pollen.

In my judgment one of the most practical and satisfactory locations for the breeding plot is in a larger field of corn planted with seed which

is as nearly as possible of the same breeding as that planted in the breeding plot itself. The stock seed for this field should always be selected from the previous year's breeding plot and it may well include as many of the 160 rejected ears as are known to be above the average of the 200. Or, if the breeding plot can be well isolated from all other corn fields and still occupy good soil, this also makes a very suitable location for it.

The very best ears of seed corn are planted in the center rows of the breeding plot, the remainder of the ears being planted in approximately uniform gradation to either side, so that the least desirable ears among the 40 are planted in the outside rows; and in the final selection of the best field rows from which the next year's seed ears are to be taken, some preference is given to the rows near the center of the plot.

While we are not yet ready to make absolute statements regarding the matter, never the less, from the data which we have secured, and are securing upon the subject, we now recommend that every alternate row of corn in the breeding plot be completely detasseled before the pollen matures and that all of the seed corn to be taken from the plot be selected from these 20 detasseled rows. This method absolutely prohibits self-pollination or close-pollination of the future seed. By self-pollination is meant the transfer of pollen from the male flower of a given plant to the female flower of the same plant; and by close-pollination is meant the transfer of pollen from the male flower of one plant to the female flower of another plant in the same row, both of which grew from kernels from the same seed ear.

The transfer of pollen from one plant to another plant which grew from kernels from a different seed ear, we term cross-pollination. We have been for several years accumulating data which show that artificial self-pollination is very injurious to the vitality and vigor of the seed produced, and we have also secured data pointing toward an injurious effect of close-pollination even by natural methods, so that we feel justified in recommending, at least tentatively, the use of cross-pollination in seed corn breeding.

It is also recommended that in the 20 rows of corn which are not detasseled no plants which appear imperfect, dwarfed, immature, barren,

or otherwise undesirable, should be allowed to mature pollen. Detasseling is accomplished by going over the rows two or three times and carefully pulling out the tassels as they appear.

Occasionally an entire row is detasseled because of the general inferiority of the row as a whole.

### Field Selections Based on Performance Records.

As the corn crop approaches maturity we are then ready for the first time to begin at the real beginning in the selection of seed corn; that is, with the whole corn crop and the whole corn plant, as it stands in the field.

We then make our first selection of seed corn from the field rows (each of which is the progeny of a separate single ear) on the basis of performance record. Each of the twenty detasseled rows is carefully examined. Some of them are discarded for seed purposes by simple inspection, and with some rows this decision may be made early in the growing season; because, when each field row is planted from a separate individual ear, that row has an individuality which in many cases is very marked. It may show very imperfect germination (in the most careful work the germinating power of each ear is ascertained before planting), it may be of slow growth, produce small, weak plants, or numerous barren stalks. The plants may be tall and slender or very thick and short. In one row the ears may be borne high on the stalks, while in the adjoining row they may average one or two feet nearer the ground. One row may yield more than twice as much corn as an adjoining row on the same kind of soil. As a matter of fact, when one begins to breed corn by the row system (one seed ear to each row) he is usually surprised to find that the plants in some rows are so very different from those in others, as will be seen from data from one of our 1901 breeding plots, which are given in table 4.

Table 4.—Performance Record of Breeding Plot, 1901.

(Breeding for high protein.)

Field Row No.	Protein. in seed ear.	Weight of ear corn in crop.
1 .....	12.06	91.0
2 .....	12.17	86.0
3 .....	12.19	98.5
4 .....	12.26	99.5
5 .....	12.31	77.0
6 .....	12.40	118.0
7 .....	12.66	116.0
8 .....	12.83	54.5
9 .....	12.00	107.0
10 .....	15.78	103.0
11 .....	12.93	87.0
12 .....	12.90	127.5
13 .....	12.72	113.0
14 .....	12.45	123.5
15 .....	12.32	103.5
16 .....	12.31	92.0
17 .....	12.23	85.5
18 .....	12.18	117.0
19 .....	12.07	140.5
20 .....	12.06	97.0
Average .....	12.51	101.8

We take no seed from a row which produces a large proportion of imperfect plants, barren stalks, small ears or a low yield, even though a few apparently good seed ears might be found in the crop which that row yields.

The points to be considered in the selection of the field rows, and finally in the individual plants from which seed ears may be taken should include the per cent of "stand" of plants, the height and physical proportions of the plant, the character and amount of foliage, the position of the ear on the stalk, the length and size of the ear shank, the per cent of ear-bearing plants, the time of maturity, the total yield of the row, the average weight of the ears, and the number of good seed ears which the row produces.



Some of these points can be determined by inspection; some require actual counts and measurements or weights.

The corn from each of the detasseled rows which have not been rejected by inspection is now harvested. First, all of the ears on a row which appear to be good ears and which are borne on good plants in a good position and with good ear shanks and husks are harvested, placed in a bag with the number of the row, and finally weighed together with the remainder of the crop from the same row. The total weight of ear corn which the row yields is the primary factor in determining the 10 best rows from which all of the 200 ears for the next year's selection must be taken; and yet no corn breeder should follow even this rule absolutely or blindly. If it should happen that one of these ten best yielding rows, although slightly higher in yield, is nevertheless plainly inferior to some other row in the number of good ears produced, the row selected should be changed accordingly. Yield is of first importance, but it should not exclude all other points. It is more practical and profitable to produce 99 pounds of good ears than 100 pounds of nubbins. Other things being equal, or nearly so, preference is also given to the rows nearest the center of the field, for reasons already explained and well illustrated in Table 4.

In the final selection of the 40 seed ears we prefer to have as many as possible of the ten best field rows represented, and we frequently sacrifice slight advantages in chemical composition for the sake of having such a large representation, because of the possible future evil effects of too close in-breeding.

Each lot of 20 ears (more or less) from each of the ten best rows and finally each single ear of the 40 seed ears ultimately selected is kept labeled, and permanent records are made of the number and the description of the ear, the composition of the grain, performance record of the row, etc., so that as the breeding is continued an absolute pedigree is established, on the female side, for every ear of corn which may be produced from this seed so long as the records are made and preserved. We also know absolutely that we have good breeding on the male side although the exact individual pedigrees of the males cannot be known and recorded. The corn which we first began to breed (see bulletin No. 55, Illinois Experiment Station) we are this season growing in five different

breeding plots in Illinois, and it is now being grown in two or three other states, and every ear which is grown this year in any of those breeding plots has an established and recorded pedigree for seven generations. For example, each of the ears of corn which was grown the past season in our high protein breeding plot has a recorded pedigree showing the protein content of its dam, of its grand dam, of its great grand dam, of its great, great grand dam, of its great, great, great grand dam, and its great, great, great, great grand dam.

In conclusion let me say that, to the practical corn breeder, I would urge only three things:

First: Adopt the row system, plant 20 to 40 good seed ears, one ear to a row; then select your seed for the next year, on the basis of performance record, from about 10 rows which product the highest yield and the best ears.

Second: Breed corn for a purpose. If you wish to feed corn, breed and grow high protein corn. If you wish to grow corn for the starch and glucose factories, breed and grow corn the factory wants.

Third: Until we have facts, don't devote too much time to "fancy points," such as trying to produce kernels on the tip end of the cob, or trying to reduce the size of the cob, or trying to make the tip end of the ear as large as the butt, or pulling out suckers, or doing other things the ultimate effect of which is unknown. It is not yet known with any degree of certainty whether such things are beneficial, injurious, or without effect, on the production of the crop.

And don't feel that you can't breed corn even if you are unable to detassel barren stalks. Last year we had fields with 50 per cent of barren stalks,—this year in some fields from that seed we have about five-tenths of one per cent of barren stalks, and these examples fairly illustrate the tremendous effect of soil and season and condition of growth, as compared with breeding, upon the production of barren stalks. Barren stalks bear no ears, and the whole tendency of Nature's law is to breed them out, and even without the intervention of man. As a matter of fact, in order to give to barren stalks an equal chance with ear-bearing plants to propagate themselves, we should be obliged to detassel every ear-bearing plant in the field. In studying this problem it should be

borne in mind that the female parent of the barren stalk was not barren.

It is probably much more important that we absolutely prevent self-pollination and close-pollination by detasseling alternate rows, but even this practice is still an experiment. It is very true that exceedingly poor corn has been produced by artificial or hand self-pollination but recent experiments have also shown that corn may be degenerated by artificial cross-pollination; and it should be understood that our recommendation to detassel alternate rows in the breeding plot is tentative, and I certainly would not urge this practice. Probably such detasseling will prove somewhat helpful to the corn breeder, but we know that very great improvement can be made without detasseling at all, simply by selecting seed on the basis of performance record and for desirable quality or composition.

## Directors' Meetings

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1902-1903.

On call by President Newman the Directors met at Springfield Oct. 2, 1902, Directors Joseph Newman, J. R. Biddulph, R. R. Murphy, G. H. Gurler and F. A. Carr were present.

The object of the meeting was to arrange for the annual convention January 6-7-8, 1903. The meeting was called at the St. Nicholas hotel for 2 p. m., October 2, but adjourned to meet at the State Capitol at 8 p. m.

It was decided to hold the 1903 convention at the State Agricultural College, University of Illinois. Secretary Geo. Caven and Prof. W. J. Fraser were instructed to prepare the program.

The matter of dividing the pro rata purse to be offered on butter exhibited at the annual convention came up for discussion. It was decided to offer a first prize of \$25 for the highest scoring creamery butter, and \$15 to the highest scoring "dairy" entry. Also it was decided to admit into the pro rata all creamery entries that scored 92 or over and all dairy entries that scored 90 or over. The highest scoring tub in each of these classes was not to participate in the pro rata unless the highest in the pro rata class exceeded the special or sweepstakes prize in that class. A general discussion concluded the session and on motion the meeting adjourned.

GEO. CAVEN, Secretary.

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### THE BLOOMINGTON MEETING.

Directors of the Association met at Bloomington, February 23rd, 1903, during the convention of the State Farmers' Institute. This was the first

meeting after the January convention and was attended by President Newman, J. R. Biddulph, J. S. Spies and John Coolidge of the Board of Directors. Treasurer H. H. Hopkins and Secretary Geo. Caven were present and offered their reports, which were accepted and given into the hands of President Newman and G. H. Gurler to be audited.

A duty of this meeting was the election of a Treasurer and secretary and the old officers were retained in these positions. On motion of Director Spies the Secretary was instructed to cast the ballot of the Directors for H. H. Hopkins, of Hinckley, for Treasurer, and that being done President Newman declared Mr. Hopkins elected for the ensuing term.

On motion offered by Director Coolidge the Secretary was instructed to cast the Directors' ballot for Geo. Caven, of Chicago, for Secretary, and that being done the president declared Mr. Caven elected for the ensuing term.

On motion of Mr. Spies the President, Vice President and Secretary were made a committee to decide on the date for the next meeting, and on motion of Mr. Coolidge, the President was empowered to appoint a committee that should decide upon the place of meeting of the next annual convention. Mr. Spies spoke for the southern part of the state for the next meeting and the Directors were all favorable if the proper arrangements could be made.

The Secretary was instructed to get a new minute book for entering reports of meetings of the directors. Adjourned.

GEO. CAVEN, Secretary.

The Secretary's report of money that came into his hands was as follows:

#### Receipts.

Treasurer's check for mailing reports.....	\$ 45.00
Memberships .....	115.00
Heller & Merz .....	25.00
D. H. Burrell & Co.....	10.00
Mayor of Champaign .....	50.00

Mayor of Urbana .....	50.00
Elgin Butter Tub Co. ....	10.00
Dairy Mutual Insurance Co. ....	10.00
Diamond Crystal Salt Co. ....	10.00
C. H. Weaver & Co. (for butter).....	77.83
DeLaval Separator Co. ....	30.00
Wells, Richardson & Co. ....	25.00
Vermont Farm Machine Co.....	30.00
The Sharples Co. ....	10.00
A. H. Barber Mfg. Co. ....	10.00
Sturges & Burn Mfg. Co. ....	10.00
Worcester Salt Co. ....	10.00
Creamery Pkg. Mfg. Co. ....	50.00
Empire Cream Separator Co. ....	10.00
Check on Treasurer .....	68.98
Check on Treasurer .....	3.35
<b>Total .....</b>	<b>\$660.16</b>

### Expenses.

Express, freight, drayage .....	\$ 10.40
Stamps (including mailing reports).....	56.50
Telephone .....	1.50
Telegrams .....	3.00
Envelopes and wrapping paper .....	4.55
Traveling expenses .....	21.43
Corporation report .....	1.25
Miscellaneous .....	16.90
On account of speakers .....	32.80
<b>Paid to H. H. Hopkins, Treasurer .....</b>	<b>511.83</b>
<b>Total .....</b>	<b>\$660.16</b>

## TREASURER'S REPORT.

Hinckley, Ill., Feb. 21, 1903.

To the President and Board of Directors of the Illinois State Dairymen's Association: I herewith submit the following report:

June 15, 1902, on hand as per last.....	\$ 4.74
July 17, received from President .....	1500.00
Dec. 24, received from Secretary .....	10.00

1903

Jan. 12, received from Secretary .....	206.00
Jan. 21, received from Secretary .....	40.00
Jan. 27, received from Secretary .....	162.83
Jan. 30, received from Secretary .....	20.00
Feb. 16, received from Secretary .....	73.00

Total .....	\$2016.57
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Paid the following orders, drawn on me by Secretary:

Date received from bank, Nov. 1, 1902, No. 602.....	\$ 8.50
Date received from bank, Nov. 1, 1902, No. 657.....	100.00
Date received from bank, Nov. 1, 1902, No. 658.....	15.00
Date received from bank, Nov. 1, 1902, No. 659.....	6.00
Date received from bank, Nov. 1, 1902, No. 660.....	6.75
Date received from bank, Nov. 1, 1902, No. 661.....	10.00
Date received from bank, Nov. 1, 1902, No. 662.....	35.50
Date received from bank, Nov. 1, 1902, No. 663.....	45.00
Date received from bank, Jan. 1, 1903, No. 664.....	11.00
Date received from bank, Jan. 1, 1903, No. 665.....	18.90
Date received from bank, Jan. 1, 1903, No. 666.....	9.80
Date received from bank, Jan. 1, 1903, No. 667.....	16.80
Date received from bank, Jan. 1, 1903, No. 668.....	17.67
Date received from bank, Jan. 1, 1903, No. 669.....	20.50
Date received from bank, Jan. 1, 1903, No. 670.....	3.50
Date received from bank, Feb. 18, 1903, No. 671.....	100.00
Date received from bank, Feb. 18, 1903, No. 672.....	57.70
Date received from bank, Feb. 18, 1903, No. 673.....	15.10
Date received from bank, Feb. 18, 1903, No. 674.....	68.98

Date received from bank, Feb. 18, 1903, No. 675.....	43.50
Date received from bank, Feb. 18, 1903, No. 676.....	25.00
Date received from bank, Feb. 18, 1903, No. 678.....	16.21
Date received from bank, Feb. 18, 1903, No. 679.....	9.71
Date received from bank, Feb. 18, 1903, No. 680.....	10.03
Date received from bank, Feb. 18, 1903, No. 681.....	11.85
Date received from bank, Feb. 18, 1903, No. 682.....	17.47
Date received from bank, Feb. 18, 1903, No. 683.....	5.91
Date received from bank, Feb. 18, 1903, No. 684.....	27.72
Date received from bank, Feb. 18, 1903, No. 685.....	24.50
Date received from bank, Feb. 18, 1903, No. 686.....	25.65
Date received from bank, Feb. 18, 1903, No. 678.....	32.83
Date received from bank, Feb. 18, 1903, No. 688.....	8.61
Date received from bank, Feb. 18, 1903, No. 689.....	25.54
Date received from bank, Feb. 18, 1903, No. 690.....	20.00
Date received from bank, Feb. 18, 1903, No. 691.....	5.00
Date received from bank, Feb. 18, 1903, No. 692.....	12.50
Date received from bank, Feb. 18, 1903, No. 694.....	10.00
Date received from bank, Feb. 18, 1903, No. 695.....	2.50
Date received from bank, Feb. 18, 1903, No. 696.....	12.25
Date received from bank, Feb. 18, 1903, No. 697.....	8.75
Date received from bank, Feb. 18, 1903, No. 698.....	12.50
Date received from bank, Feb. 18, 1903, No. 699.....	12.50
Date received from bank, Feb. 18, 1903, No. 700.....	10.00
Date received from bank, Feb. 18, 1903, No. 701.....	10.00
Date received from bank, Feb. 18, 1903, No. 703.....	5.00
Date received from bank, Feb. 18, 1903, No. 704.....	21.30
Date received from bank, Feb. 18, 1903, No. 705.....	10.00
Date received from bank, Feb. 18, 1903, No. 706.....	15.00
Date received from bank, Feb. 18, 1903, No. 709.....	12.50
Date received from bank, Feb. 18, 1903, No. 711.....	6.25
Date received from bank, Feb. 18, 1903, No. 712.....	3.75
Date received from bank, Feb. 18, 1903, No. 713.....	7.50
Date received from bank, Feb. 18, 1903, No. 715.....	3.75
Date received from bank, Feb. 18, 1903, No. 716.....	4.00



Date received from bank, Feb. 18, 1903, No. 717.....	5.00
Date received from bank, Feb. 18, 1903, No. 718.....	2.50
Date received from bank, Feb. 18, 1903, No. 720.....	2.00

Total paid out on orders .....	\$1065.88
Total receipts for year .....	\$2016.57
Paid out .....	1065.88

Feb. 21, amount on hand .....\$ 950.69

As per bank book and orders herewith.

Respectfully submitted,

H. H. HOPKINS, Treasurer.

A number of orders out at the time of making the report had not been presented for payment, including an order for paying for printing the 3,000 copies of the annual report. Between the time of making the report and June 30, 1903, all the orders had been presented and orders given for all the expenses to date and a subsequent statement shows the condition of the funds on that date.

Hinckley, Ill., June 30, 1903.

Joseph Newman, President:

Dear Sir: The \$950.69 balance in my report of Feb. 21, 1903, was increased by \$10 received from the Secretary, making \$960.69. From this orders to the amount of \$951.94 have been paid, leaving a balance in the treasury of \$8.75.

H. H. HOPKINS, Treasurer.

The funds of the association met all the expenses of the year, except one-half the secretary's annual salary of \$200. The funds, therefore, were \$91.25 short of the expenses of the year.

# The 1904 Convention

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## Illinois Dairymen's Association at Greenville, January 5, 6 and 7, 1904.

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The next convention of the Illinois Dairymen's Association will be held at Greenville Jan. 5, 6, 7, 1904.

This is in the southern dairy district of the state. It is a growing district and a large part of the milk goes to St. Louis. Dairy conditions are much the same in this as in the Fox river country of the northern part of the state. The milk goes to creameries for butter making, to condensaries and to supply sweet cream and milk for the St. Louis market. Condensaries are located at Highland, Greenville, Effingham and Marshall. A number of creameries have recently been built in this territory and are all doing good business. It will be interesting for any dairyman of the state to visit this part of Illinois during the convention to see what has been and is being done in dairy development. We are assured that there will be a good attendance of local dairymen at the sessions. We will have an excellent program. Don't forget the dates, Jan. 5, 6, 7, 1904

# **REPORT**

## **OF THE**

### **Fifth Annual Butter Fair of the Sangamon County Butter Makers' Association**

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Maple Grove Farm, April 15, 1903.

For six years the wives and daughters of the Sangamon county farmers have made a study of scientific butter making and have held monthly meetings at which the subject has been discussed in its every phase. The result has been very perceptible in a notable improvement in the quality of butter offered on the market by the farm wives of "Old Sangamon." The ladies are very proud of their organization, it being the only association of women buttermakers in the country. Each year they have held a fair and on February 19th the fifth annual fair of Sangamon County Buttermakers Association was opened at the Japanese Home in the City of Springfield, with an exhibit which excelled in merit all previous efforts of the organization. Officers of the association were pleased and surprised at the excellent showing made in spite of severe weather and the fact that the country roads were almost impassable. Judging from the interest manifested in the show, if the weather had been favorable and roads passable the display would have been simply enormous.

On long tables extending the entire length of the hall, in uniform white crocks, each holding three pounds, arranged in their several classes, were hundreds of pounds of butter. So much butter of like quality was probably never before gathered together in an exhibit by women. One of the first exhibits to attract the eye of the visitor was a lot of ornamental butter in a fine glass case, full of golden works of art, which

would be prized if they were made of less perishable material than butter. One exhibit of ornamental table butter, which attracted much attention, was a pineapple done in butter, by Asa Sterling, of Rochester township, who is 87 years old. It was deftly worked and is very realistic, the only tool used being a pie gigger which had been in the Sterling family seventy-five years, and used in making pies whenever made all these many years. This pine apple of Mr. Sterling's has been a feature at each of the five annual fairs of the Association. Each year he takes the finest specimen of butter, his daughter, Mrs. Sterling, secretary of the Association, can produce and shape it into a perfect image of the fruit. He is now five years older than he was when he did his first work for the fair and each year shows a marked improvement. A most beautiful exhibit was the creation of Mrs. Carrie Bradford, of Gardner township, who had wrought from the golden butter a fine basket of tube roses, set in an oblong frame, around which was entwined wreathes of flowers. Mrs. Lee Hickox displayed a plate of fancy butter balls. Mrs. J. P. Plummer, of Rochester township, a pine cone. Another artistic exhibit was a section of a log upon which grows a plant, the work of Miss Nettie Nokes. Following is a list of prize winners:

First Premiums—Mrs. Carrie Bradford, of Gardner township; Mrs. J. M. Council, of Lanesville township; Mrs. M. F. Megredy, of Loami township; Mrs. S. E. Smith, of Rochester township; Mrs. Lee Hickox, of Springfield township; Mrs. Mary Poorman, of Williams township; Nettie Nokes, of Woodside township; Mrs. Elivabeth Vohes, of Cursan township; Mrs. Frank Welch, of Illiopolio township; Mrs. E. A. Sterling, of Rochester township; Mrs. Frank McVeigh, of Clear Lake township; Miss Lottie Alson, of Curran township; Mrs. Nannie Gunnett, of Curran township; Mrs. Henry Jacobs, of Loami township; Lewis Wiggins, of Springfield township.

Second prize winners—Mrs. Nanny Gunnett, Mrs. George Berry, Miss Flora Council, Miss Maude Gilbert, Mrs. E. A. Sterling, Mrs. Mary Poorman, Miss Nettie Nokes, Mrs. M. T. Megredy, Leland farm.

Sweepstakes Class—A, old style, Mrs. J. M. Council. Class B—Deep setting or creamery, Mrs. Elizabeth Vorhes. Class C—Separator butter, Mrs. J. M. Council. Class D—Print, Mrs. Mary Poorman. Grand

sweepstakes—Lewis Wiggins, Leland farm. Granulated butter, first prize, Mrs. J. M. Council; second prize, Mrs. E. A. Sterling; third prize, Mrs. M. F. Megredy. Best display of artistic ornamental butter, Mrs. Carrie Bradford. Best ornamental table butter, Mrs. E. A. Sterling, first prize; Miss Annetta Nokes, second prize.

In the course of the fair many new names were added to the membership list and the officers are planning many new features for future meetings. Hon. Joseph Newman, President of the Illinois State Dairymen's Association, very kindly sent Prof. Oscar Erf to score the butter, which gave complete satisfaction. The professor is from the University of Illinois, and the ladies were very much elated that they were able to have such an expert scorer. After the scoring of the butter Prof. Erf gave a very instructive talk to the ladies on the subject of scientific butter making. The fair was one of the most successful in the history of the organization. In the point of number of exhibits, in the excellence of butter displayed and from a financial standpoint the show was ahead of any of its predecessors. The butter was sold at a figure far above the market price for country butter. An unexpected feature of the last day of the fair was that several sneak thieves entered the hall and took advantage of the opportunity presented when the members of the Association were absorbed in the work of Prof. Erf, in the scoring of the butter, to carry away about thirty-five pounds of the prize butter. Another year it must be protected from that class of people. The ladies are satisfied that it will be best to hold their fair each year in November or the first part of December. The country roads and weather are so much more pleasant. Hoping in the future to merit the kindness shown us by the dairymen of Illinois in the past, we beg for a continuance of past favors.

MRS. E. A. STERLING,

Secretary and Treasurer Buttermakers' Assn.

## COLLEGE OF AGRICULTURE.

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The University of Illinois is situated in the eastern central part of the State, 128 miles south of Chicago and between the twin cities of Urbana and Champaign. It is at the junction of the Illinois Central, the Big Four, and the Wabash railroads.

Conspicuous among the buildings on the campus is the Agricultural Group, which was erected at a cost of \$150,000 and is devoted exclusively to the work of the Agricultural College and Experiment Station. The group consists of four separate structures built around an open court and connected by corridors. The main building is 248 feet long, from 50 to 100 feet in depth, and three stories high. It contains offices, class rooms, and laboratories for the departments of agronomy, animal husbandry, dairy husbandry, horticulture, and veterinary science; the chemical laboratory of the Experiment Station; commodious administration rooms; all assembly rooms with a seating capacity of 500, and on each floor a fireproof vault for records. The other three buildings are each 45 by 116 feet and two stories high; one is for dairy manufactures, one for farm machinery, and one for veterinary science and stock judging. These buildings are of stone and brick, roofed with slate, and contain, all told, 113 rooms, and a total floor space of nearly two acres.

The State legislature has, in the past few years, made generous appropriations for the College of Agriculture and it is now well equipped and fully prepared to give instruction in the various subjects.

### Department of Dairy Husbandry.

The work in dairying is divided into three lines:

1. The economic production of milk, which includes the proper

management of a dairy farm and the selection, breeding and care of the dairy herd.

2. The best methods of sanitary production, care, and handling of milk.

3. The manufacture of butter and cheese.

Since dairy products as placed upon the market today are often of an inferior quality the need of scientifically trained dairymen is apparent. In no other way can the quality of Illinois dairy products be improved so readily as by training her men in the best methods of the production of milk and in the manufacture and care of dairy products. There is a constantly increasing demand for men who have received such training and can successfully manage a dairy farm and care for the herd in such a manner as to produce milk most economically: for men who understand the methods of sanitary milk production and are capable of operating a milk depot; also for men skilled in the manufacture of butter and cheese and who can operate a creamery or cheese factory successfully. It is the aim of the Department of Dairy Husbandry to prepare men for such positions by giving them a good liberal dairy education.

A farm of four hundred acres, located a short distance from the campus, is owned by the University; one hundred and twenty acres of which have been assigned to the Department of Dairy Husbandry. Here is grown much of the feed for the dairy herd, including pasture, alfalfa and clover for hay, and corn for a two hundred ton silo.

An opportunity is thus afforded the student to study the management of a dairy farm, the feeds best suited for the dairy herd and how these may be largely grown upon the farm, which feeds will best supplement others and those upon which a cow will produce the greatest and most economical yield.

### THE HERD.

The dairy herd consists of thirty-five cows, three bulls, and a number of heifers and calves.

In this herd are representatives of four leading dairy breeds, Jersey, Guernsey, Holstein-Friesian, and Ayrshire, and a few grades. The herd

is kept for the purpose for furnishing specimens for judging and for experimental work, also to give instruction in the sanitary production of milk for direct consumption. It contains some exceptionally good individuals.

Rose, a grade cow, was purchased near the University for \$50.00. She is fourteen years old and her average production for the last nine years has been 7595.1 pounds of milk containing 379.2 pounds of butter fat. Her largest yearly record was 11,329 pounds of milk containing 564.8 pounds of butter fat.

Zuider Zee Agnes, No. 2208, W. H. F. H. B., gave with her first calf 11,364.2 pounds of milk containing 390.8 pounds of butter fat. With her second calf she averaged 68 pounds of milk per day for thirty days and one day gave 76 pounds. Her largest weekly yield of butter fat was 17.8 pounds.

Johanna Rue 2d's Paul de Kol, No. 21,724 H. F. H. B., bred by Gillette and son of Rosendale, Wisconsin, is at the head of the Holstein-Friesian herd. His dam has a record of 662 pounds of butter fat and his granddam 704 pounds of butter fat in a year. They each have a record of over 21 pounds of butter in a week and the granddam on the sire's side has a record of 25¾ pounds of butter in a week. This shows that he is exceptionally well bred, and what is even more valuable, his produce are also good performers. He has thirteen daughters in the Advanced Register, one with a record of more than 24 pounds in a week. He is an exceptionally good individual and although over nine years old is still strong and vigorous.

### STOCK JUDGING.

A knowledge of the essential points of a good dairy cow is necessary not only in selecting a herd but also in attaining the highest success as a breeder of either grades or pure breds. Since the important factors that go to make up an ideal dairy cow are practically the same for all breeds the object in the judging of dairy cattle is to familiarize the student with the essentials of such a cow. This is done by first studying cows regardless of breed, from the one standpoint of a good individual.



After the student has the important points firmly fixed in mind each of the different breeds is taken up separately and its characteristics and adaptability studied. The only way this information can be successfully obtained is by each student getting a large amount of actual practice in judging and for this purpose two hours a day two days in the week during course 2 are spent in judging dairy cattle.

### THE DAIRY BARN.

The barn has recently been remodeled, putting in a cement floor and continuous cement mangers. It is provided with the King system of ventilation and the Drown iron stall, making it one of the most sanitary barns in the State. Both mangers are connected with the University water system so that the cows may be watered by simply turning a faucet. In pleasant weather they are turned into a well graded yard for an hour or two each day for exercise.

### The Sanitary Production of Milk.

A milk route is conducted in the towns of Urbana and Champaign and the milk sold for direct consumption. In the production of this milk the greatest precautions are taken to keep it as free from dirt, bacteria, and odors as possible. The barn floor is scrubbed each day and immediately before milking all loose dirt is brushed from the cows, their udders washed, and the milkers wash their hands and put on clean white suits.

After the milk is drawn it is removed from the stable to a small sanitary dairy adjacent and aerated and cooled to 50 degrees F. or below, within five minutes from the time it is drawn. The milk is then bottled and placed in ice water until delivered.

The dairy has a cement floor and brick walls painted white. It is equipped with a turbine cream separator, Babcock tester, and bottle washer. A 6 h. p. upright boiler furnishes steam for these and also for heating water for washing and steam for sterilizing the bottles and dairy utensils. All the bottles and utensils used in handling the milk

are carefully sterilized after each using by being placed in a large cement sterilizer the door tightly closed and live steam turned on for twenty minutes.

### The College Creamery.

The Dairy wing which is 45 by 116 feet, is divided into a creamery room 30 by 45 feet, cheese, cheese curing, and milk rooms, a wash room where all utensils are cleaned and sterilized, two store rooms and a room containing the engine and refrigerating machine. The milk testing laboratory is on the second floor.

In the creamery room are two receiving vats, in which the temperature of the milk may be controlled by means of circulating brine, the most improved makes of cream separators, both hand and power, cream ripening vats, a box churn, and three different styles of combined churns and workers. The machinery is operated by a 40 h. p. engine which receives the steam through a high pressure main from the University boiler house, about eighty rods distant.

The creamery is also equipped with an 8 ton Barber refrigerating machine, by means of which the refrigerator may be held at any desired temperature down to within a few degrees of zero F. The milk and cream may be cooled in the creamery room by pumping the cold brine from the tank in the refrigerator through insulated pipes to the vats and the cooler.

All students taking the creamery work become familiar with and have a large amount of actual practice in the creamery in operating all of the important makes of cream separators and churns, the engine and the refrigerating machine and in the handling of milk, cream and butter.

### Students Making Cheese.

The cheese room is equipped with all of the apparatus necessary for making Cheddar and fancy cheese. Students are thoroughly drilled in all the steps of cheese making and spend a considerable amount of time in actual practice.

The Department of Dairy Husbandry is much better prepared than before to give instruction along the various lines of dairying as the instructional force for the coming year has been doubled.

The college year is divided into two semesters of eighteen weeks each. The first extends from September 11th to January 29th; the second from February 1st to June 3d.

### Course of Study.

1. Milk .....	Sept. 14 to Jan. 29.
2. Dairy Cattle .....	Sept. 14 to Nov. 13.
3. Dairy Farm Management .....	Nov. 16 to Jan. 29.
4. Cream Separation .....	Nov. 16 to April 1.
5. Butter Making .....	Nov. 16 to April 1.
7. Factory Management .....	Feb. 1 to June 3.
8. City Milk Supply .....	Feb. 1 to June 3.
9. Comparative Dairying .....	Sept. 14 to Jan. 29.
10. Dairy Husbandry Minor .....	Sept. 14 to Jan. 29.
11. Dairy Bacteriology .....	Sept. 14 to Jan. 29.
13. Fancy Products .....	Feb. 1 to June 3.
14. Cheddar Cheese .....	Sept. 14 to Nov. 13.
15. Fancy Cheese .....	April 4 to June 3.

### Description of Courses.

1. **Milk.**—This consists of a thorough study of the character and composition of normal milk, including practice in determining amount of butter fat and adulterations with the Babcock test and lactometer, the importance and proper methods of standardizing milk and cream, and precautions that should be taken to prevent milk from becoming contaminated with dirt and bacteria. Lectures, reference reading and laboratory work. First semester; Monday, Wednesday and Friday; 3 semester hours.

2. **Dairy Cattle.**—The cow as a factor in the economic production of milk, butter and cheese; difference in the efficiency of individual cows; establishment of the dairy herd by selection and grading with pure bred sires;; the principal characteristics of the dairy cow, with extensive practice in judging; the various breeds adapted to dairy pur-

poses, their history and characteristics, with practice in judging by both dairy and breed standards. First semester; first half; daily; 2½ semester hours.

3. **Dairy Farm Management.**—Soiling and pasturing dairy cows; crops adapted to the dairy farm, and the best method of converting these into milk; the place and value of the silo on the dairy farm and the best methods of handling and feeding ensilage, a study of the best and most economical systems of feeding, together with the care and raising of calves; housing and general care of the herd; arrangement, ventilation and care of dairy barn. First semester; second half; daily; 2½ semester hours.

4. **Cream Separation.**—A critical study of the different methods of cream separation as to rapidity and efficiency; a comparison of the different kinds of centrifugal separators; special attention being given to the effect of varying conditions of the milk on separation. Extensive practice is given with various makes of separators in the College creamery; designed to be taken in conjunction with course 5. First semester; second half; second semester; first half; Tuesday, Thursday and Saturday; 2½ semester hours.

5. **Butter Making.**—This course offers the student an opportunity to become an expert buttermaker. It covers ripening the cream, including the use of artificial starters, churning, working, packing, and scoring of butter. Extensive practice is given in the College creamery with different churns, including the various makes of combined churns and workers; designed to be taken in conjunction with course 4. First semester; second half; second semester; first half; Tuesday, Thursday, and Saturday; 2½ semester hours.

7. **Factory Management.**—Care of engines, boilers and refrigerating machines; practice in pipe cutting and soldering; co-operative and company creameries and cheese factories; planning, construction, equipment, and operation of plants; creamery bookkeeping; designed to be taken in conjunction with courses 4, 5, 14, and 15. Second semester; Monday, Wednesday and Friday; 3 semester hours.

8. **City Milk Supply.**—Proper methods of producing, cooling, handling, shipping and distributing milk for direct consumption. Methods of production and preparation for sale of certified milk. A study of the milk supply of several cities of the State. This work is well illustrated by the production and sale of certified milk at the University dairy. Second semester; Tuesday and Thursday; 2 semester hours.

9. **Comparative Dairying.**—A study of the dairy systems and practices of different countries, including the care and management of dairy cattle. The principal dairy products of the different countries and the methods of handling and sale, particularly the preparation of milk for direct consumption. The more important conditions, historical and present and local and inherited influences affecting dairy practices. Recitations, reference readings, and illustrated lectures. First semester; Monday, Wednesday, and Friday; 3 semester hours.

10. **Dairy Husbandry Minor.**—A study of the composition and variations of milk; detection of adulteration by means of the Babcock test and lactometer; standardizing milk and cream; methods of detection of impure and unwholesome milk; where and to what extent milk becomes contaminated and methods of prevention; scoring of butter and cheese. This course is required for graduation of all students in agriculture who do not take more extended courses in Dairy Husbandry. First semester; Monday, Wednesday and Friday; 3 semester hours.

11. **Dairy Bacteriology.**—A careful study of the distribution of bacteria as determined by the bacteriological analysis of air in the open field, dairy room, and dairy barns under different conditions, showing where and to what extent milk becomes contaminated during the process of milking and subsequently; also how this contamination may be largely avoided by proper methods. The effect of bacteria on milk and on the rapidity with which it sours after being produced under different degrees of cleanliness and held at different temperatures. The part that bacteria play in the ripening of cream and making of butter and in the manufacture and ripening of cheese. First semester; daily; 5 semester hours.

12. **Investigation and Thesis.**—In the senior year a special line of original investigation is arranged with each student, the object being to develop the student's power to investigate problems for himself. This work is under the head of the department and may be upon any subject connected with dairying that is agreed upon. 5 to 10 semester hours.

13. **Fancy Products.**—The manufacture of koumiss and primost and of different grades of ice cream. A study of the modifications of milk. Second semester; Monday, Wednesday and Friday; 3 semester hours.

14. **Cheddar Cheese.**—The proper handling of milk for cheese making; aerating, cooling, and setting the milk; cutting and heating the curd; drawing the whey, dipping and milling the curd, salting and pressing the curd, curing packing and selling the cheese. First semester; first half; Tuesday, Thursday, and Saturday; 2½ semester hours.

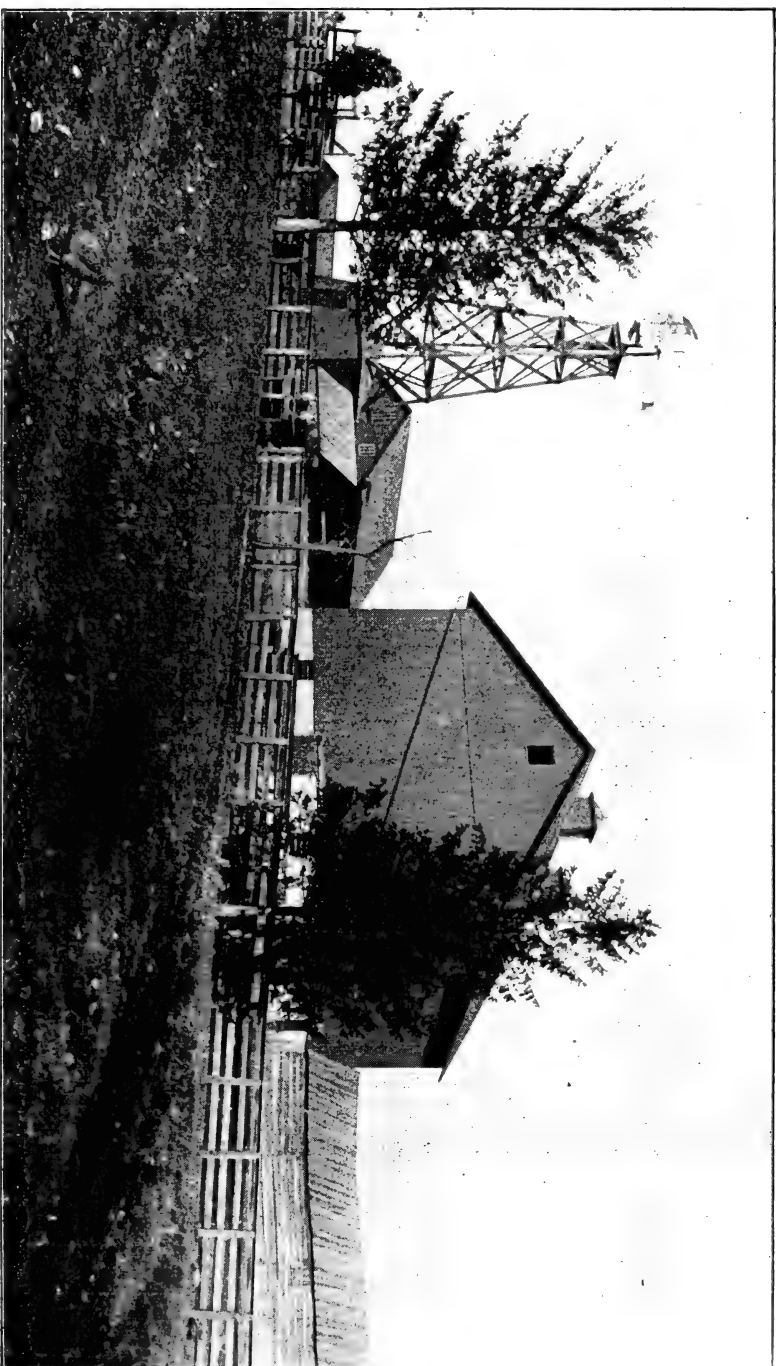
15. **Fancy Cheese.**—The manufacture, curing, and sale of different brands of fancy cheese, including brick, Swiss, Roquefort, sage, Stilton, pineapple, Edam, Gouda and cottage. Second semester; second half; Tuesday, Thursday and Saturday; 2½ semester hours.

#### Requirements for Admission.

In addition to regular students who enter the University by certificate of graduation from accredited high schools or by examination, special students are received in the College of Agriculture without examination providing they are sixteen years of age and have a good knowledge of the common branches. All subjects offered in dairy husbandry, with the exception of bacteriology, may be pursued by special students. Those who have not had two years of English are required to take that study in connection with their other work.

#### Scholarships.

The University offers every year to each county in the State and to the first ten congressional districts, one scholarship each for students in the College of Agriculture. A scholarship is good for two years and



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frees the student from the payment of all fees except for material consumed in the laboratories. Application for such scholarship should be made to the director of the State Farmers' Institute from the district in which the student resides.

### Fees.

Regular students pay a matriculation fee of \$10.00 upon entering the University and an incidental fee of \$12.00 each semester, or \$34.00 the first year and \$24.00 each succeeding year.

Special students pay the incidental fee of \$12.00 and a tuition fee of \$7.50 each semester, or \$39.00 per year.

Students holding scholarships are not required to pay any of these fees.

### Necessary Expenses.

The following are, for students attending at Urbana, estimated average annual expenses, exclusive of books, clothing, railroad fare, laboratory fees, if any, and small miscellaneous needs:

*Semester fees .....	\$ 24.00 to \$ 24.00
Room rent for each student (two in room).....	32.00 to 60.00
Table board in boarding houses and clubs.....	90.00 to 124.00
Washing .....	18.00 to 24.00

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\$164.00 to \$232.00

Board and room in private houses, per week ..... 4.50 to 6.00

\* Special students must make needed changes in the amount given for "Semester Fees."

For further information write

E. DAVENPORT,

Dean, College of Agriculture, or

W. J. FRASER,

Head, Department of Dairy Husbandry, Urbana, Illinois.

## Dairy Laws of Illinois

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Laws of 1879, page 111. (Hurd's Revised Statutes, chapter 38, sections 9-9e.)

AN ACT to regulate the sale of milk, and to provide penalties for the adulteration thereof. (Approved May 29, 1879.)

Section 1. That whoever shall, for the purpose of sale for human food, adulterate milk with water or any foreign substance, or whoever shall knowingly sell for human food, milk from which cream has been taken, without the purchaser being informed or knowing the fact, or whoever shall knowingly sell for human food, milk from which what is commonly called "strippings" has been withheld, without the purchaser thereof being informed or knowing the fact, or whoever shall knowingly sell for human food milk drawn from a diseased cow, knowing her to be so diseased as to render her milk unwholesome, or whoever shall knowingly sell for human food, milk so tainted or corrupted as to be unwholesome, or whoever shall knowingly supply, or bring to be manufactured into any substance for human food, to any cheese or butter factory or creamery, without all interested therein knowing or being informed of the fact, milk which is adulterated with water or any foreign substance, or milk from which cream has been taken, or milk from which what is commonly called "strippings" has been withheld, or milk drawn from a diseased cow, knowing her to be so diseased as to injure her milk, or milk so tainted or corrupted as to be unwholesome, or whoever shall knowingly, with intent to defraud, take from milk after it has been delivered to a cheese factory, or butter factory or creamery, to be manufactured into any substance for human food, for or on account of the person supplying the milk or cream, or shall, with like intent, knowingly add any foreign

substance to the milk or cream, whereby it, or the products thereof, shall become unwholesome for human food, shall be guilty of a misdemeanor, and for each and every such misdemeanor shall be fined not less than twenty-five nor more than one hundred dollars or confined in the county jail not exceeding six months or both, in the discretion of the court.

Sec. 2. Any person who shall adulterate milk, with the view of offering the same for sale or exchange, or shall keep cows for the production of milk for market, or for sale or exchange, in an unhealthy condition, or knowingly feed the same on food that produces impure, diseased, or unwholesome milk, shall be deemed guilty of a misdemeanor, and, on conviction, shall be punished by a fine of not less than fifty dollars nor more than two hundred dollars, for each and every offense.

Sec. 3. Any person or persons who shall in any of the cities of this State, engage in or carry on a retail business in the sale, exchange of, or any retail traffic in milk, shall have each and every case in which the milk is carried or exposed for sale or exchange, and the carriage or vehicle from which the same is vended, conspicuously marked with his, her, or their name or names, also indicating by said mark the locality from which said milk is obtained or produced, and for every neglect for such markings, the persons or persons so neglecting shall be subject to the penalties expressed in section 2 of this act; but for every violation of this act, by so marking said can, carriage, or vehicle, as to convey the idea that said milk is produced or procured from a different locality than it really is, the person or persons so offending shall be subject to a fine of one hundred dollars.

Sec. 4. Any person who shall, in any of the cities in this State, offer for sale any milk from which the cream or any part thereof shall have been taken, shall offer for sale and sell the same as skimmed milk, and not otherwise, and shall have each can or vessel in which such milk is carried or exposed for sale, plainly and conspicuously marked with the words "Skimmed Milk." Any person violating this section shall be subject to a fine not exceeding fifty dollars for each and every violation.

Sec. 5. Upon the rendition of judgment imposing a fine as provided in the foregoing sections, it shall be the duty of the justice of the peace

or other court rendering said judgment, also to render a judgment for the costs, and forthwith to issue a *capias* or warrant of commitment against the body of the defendant commanding that, unless the said fine and costs be forthwith paid, the defendant shall be committed to the jail of the county, and the constable or other officer to whose hand said *capias* or warrant shall come shall, in default of such payment, arrest the defendant and commit him to the jail of the county, there to remain, as provided by section 308 of "An act to revise the law in relation to criminal jurisprudence," in force July 1, 1874, unless such fine and costs shall sooner be paid.

Sec. 6. The addition of water or any foreign substance to milk or cream intended for sale or exchange, is hereby declared an adulteration. Any milk that is obtained from cows fed on distillery waste, usually called "swills," or upon any substance in a state of putrifaction, is hereby declared to be impure and unwholesome. Nothing in this act shall be construed to prevent the addition of sugar in the manufacture of condensed or preserved milk.

Sec. 7. Section nine of division one of an act entitled "An act to revise the law in relation to criminal jurisprudence (approved March 27, 1874); and all other acts and parts of acts inconsistent herewith are hereby repealed.

Laws of 1883, page 54 (Revised Statutes, chapter 5, section 29-32.)

AN ACT to require operators of butter and cheese factories on the co-operative plan to give bonds, and to prescribe penalties for the violation thereof. (Approved June 18, 1883.)

Section 1. That it shall be unlawful for any person or persons, company or corporation, within this State to operate, carry on, or conduct the business of manufacturing butter or cheese on the co-operative or dividend plan until such person or persons, company or corporation, shall have filed with the circuit clerk or recorder of deeds of the county in which it is proposed to carry on such business, a good and sufficient bond, to be approved by such circuit clerk or recorder of deeds, in the penal sum of six hundred dollars, with one or more good sureties, conditioned

that such person or persons, company or corporation proposing to carry on such business will, on or before the first day of each month, make, acknowledge, subscribe, and swear to a report in writing, showing the amount of product manufactured, the amount sold, the prices received therefor, and the dividends earned and declared for the third month preceding the month in which such report is made, and will file a copy of such report with the clerk of the town or precinct in which such factory is located, and will also keep publicly posted, in a conspicuous place in such factory, a copy of such report for the inspection of the patrons thereof, and that such dividends shall be promptly paid to the persons entitled thereto.

Sec. 2. Such bond shall run to the people of the State of Illinois, and shall be for the benefit and protection of all patrons of such factory, and suit may be had thereon by any person or persons injured by a breach of the conditions thereof by any action of debt for the use of the person or persons interested for all damages sustained by them.

Sec. 3. Such bond shall be recorded by the circuit clerk or recorded with whom the same is filed, and all such reports so filed with any town or precinct clerk shall be preserved by him and held subject to the inspection of any person or persons interested.

Sec. 4. Any person who shall willfully violate any provision of this act shall be liable to a fine of not less than two hundred dollars, or more than five hundred dollars, or imprisonment in the county jail for not less than thirty days nor more than six months, or both, in the discretion of the court.

Laws of 1879, page 11 (Revised Statutes, chapter 38, sections 39a-39c.)

AN ACT to prevent frauds in the manufacture and sale of butter and cheese. (Approved May 31, 1879.)

Section 1. That whoever manufactures, sells, or offers for sale, or causes the same to be done, any substance purporting to be butter or cheese, or having the semblance of butter or cheese, which substance is not made wholly from pure cream or pure milk, unless the same be manu-

ufactured under its true and appropriate name, and unless each package, roll, or parcel of such substance, and each vessel containing one or more packages of such substance, have distinctly and durably painted, stamped, or marked therein the true and appropriate name of such substance, in ordinary boldfaced capital letters not less than five lines pica, shall be punished as provided in section 3 of this act.

Sec. 2. Who ever shall sell any such substance as is mentioned in section 1 of this act to consumers, or cause the same to be done, without delivering with each package, roll, or parcel so sold, a label on which is plainly and legibly printed, in Roman letters, the true and appropriate name of such substance, shall be punished as is provided in section 3 of this act.

Sec. 3. Whoever knowingly violates section 1 or section 2 of this act shall be fined in any sum not less than ten nor more than three hundred dollars, or imprisoned in the county jail not less than ten nor more than ninety days, or both in the discretion of the court; Provided, That nothing contained in this act shall be construed to prevent the use of skimmed milk, salt, rennet, or harmless coloring matter, in the manufacture of butter and cheese.

Laws of 1881, page 74, (Revised Statutes, chapter 38, sections 9f-9g.)

AN ACT to prevent the adulteration of butter and cheese, or the sale or disposal of the same, or the manufacture or sale of any article as a substitute for butter or cheese, or any article to be used as butter and cheese. (Approved June 1, 1881.)

Section 1. That who ever manufactures, out of any oleaginous substances, or any compound of the same other than that produced from unadulterated milk, or cream from the same, any article designed to take the place of butter or cheese produced from pure, unadulterated milk, or cream of the same, and shall sell, or offer for sale, the same as butter or cheese, or give to any person the same as an article of food, as butter or cheese, shall, on conviction thereof, be fined not less than twenty-five dollars nor more than two hundred dollars.

Sec. 2. All acts or parts of acts inconsistent with this act are hereby repealed.

Laws of 1881, page 75 (Revised Statutes, chapter 38, sections 9h-9o.)

AN ACT to prevent and punish the adulteration of articles of food, drink and medicine, and the sale thereof when adulterated. (Approved June 1, 1881.)

Section 1. That no person shall mix, color, stain, or powder, or order or permit any other person in his or her employ to mix, color, stain or powder any article of food with any ingredient or material, so as to render the article injurious to health, or depreciate the value thereof, with intent that the same may be sold; and no person shall sell or offer for sale any such article so mixed, colored, stained or powdered.

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Sec. 3. No person shall mix, color, stain, or powder any article of food, drink, or medicine, or any article which enters into the composition of food, drink or medicine, with any other ingredient or material, whether injurious to health or not, for the purpose of gain or profit, or sell, or offer the same for sale, or permit any other person to sell or offer for sale any article so mixed, colored, stained, or powdered, unless the same be so manufactured, used, or sold, or offered for sale under its true and appropriate name, and notice that the same is mixed or impure is marked, printed, or stamped upon each package, roll, parcel or vessel, containing the same, so as to be and remain at all times readily visible, or unless the person purchasing the same is fully informed by the seller of the true name and ingredients (if other than such as are known by the common name thereof) of such article of food, drink or medicine, at the time of making sale thereof, or offering to sell the same.

Sec. 4. No person shall mix oleomargarine, suine, butterine, beef fat, lard, or any other foreign substance, with any butter or cheese intended for human food, without distinctly marking, stamping, or labeling the article, or the package containing the same, with the true and appropriate

name of such article, and the percentage in which such oleomargarine or suine enters into its composition; nor shall any person sell or offer for sale, or order or permit to be sold or offered for sale, any such article of food into the composition of which oleomargarine or suine has entered, without at the same time informing the buyer of the fact, and the proportions in which such oleomargarine, suine, or butterine, beef fat, lard, or any other foreign substance has entered into its composition. Provided, That nothing in this act shall be so construed as to prevent the use of harmless coloring matter in butter and cheese, or other articles of food.

Sec. 5. Any person convicted of violating any provisions of any of the foregoing sections of this act shall, for the first offense, be fined not less than twenty-five dollars nor more than two hundred; for the second offense he shall be fined not less than one hundred nor more than two hundred dollars, or confined in the county jail not less than one month nor more than six months, or both, at the discretion of the court; and for the third and all subsequent offenses he shall be fined not less than five hundred dollars nor more than two thousand dollars, and imprisoned in the penitentiary not less than one year nor more than five years.

Section 6, which makes ignorance of the provisions of the law a defense against prosecution, is repealed in the food commission bill.)

Sec. 7. The State's Attorneys of this State are charged with the enforcement of this act, and it is hereby made their duty to appear for the people, and to attend to the prosecution of all complaints under this act, in their respective counties, in all courts.

Sec. 8. All acts and parts of acts inconsistent with the provisions of this act are hereby repealed.

Laws of 1897, page 3 (Revised Statutes, chapter 38, sections 39d-39n.)

AN ACT to regulate the manufacture and sale of substitutes for butter.

Approved June 14, 1897.)

Section 1. That for the purpose of this act every article, substitute, or compound other than that which is produced from pure milk or cream



therefrom, made in the semblance of butter and designed to be used as a substitute for butter made from pure milk or its cream, is hereby declared to be imitation butter. Provided, That the use of salt and harmless coloring matter for coloring the product of pure milk or cream shall not be construed to render such product an imitation.

Sec. 2. No person shall coat, powder, or color with annatto or any coloring matter whatever any substance designed as a substitute for butter, whereby such substitute or product so colored or compounded shall be made to resemble butter, the product of the dairy. No person shall combine any animal fat or vegetable oil or other substance with butter or combined therewith or with animal fat or vegetable oil or combination of the two, or with either one, any other substance or substances, for the purpose or with the effect of imparting thereto a yellow color or any shade of yellow so that such substance shall resemble yellow or any shade of genuine yellow butter, nor introduce any such coloring matter or such substance or substances into any of the articles of which the same is composed: Provided, Nothing in this act shall be construed to prohibit the use of salt, rennet, and harmless coloring matter for coloring the products of pure milk or cream from the same.

No person shall, by himself, his agents, or employes, produce or manufacture any substance in imitation or semblance of natural butter, nor sell, nor keep for sale, nor offer for sale any imitation butter, made or manufactured, compounded or produced in violation of this section, whether such imitation butter shall be made or produced in this State or elsewhere. This section shall not be construed to prohibit the manufacture and sale, under the regulations hereinafter provided, of substances designed to be used as a substitute for butter and not manufactured or colored as herein prohibited.

Sec. 3. Every person who lawfully manufacture any substance designed to be used as a substitute for butter shall mark by branding, stamping, or stenciling upon the top and sides of each tub, firkin, box, or other package in which said article shall be kept and in which it shall be removed from the place where it is produced, in a clean and durable manner, in the English language, the word "Oleomargarine," or the word "Butterine," or the words "Substitute for Butter," or the words "Imita-

tion Butter," in printed letters in plain, Roman type, each of which shall not be less than three-quarters of an inch in length.

Sec. 4. It shall be unlawful to sell or offer for sale any imitation butter without informing the purchaser thereof, or the person or persons to whom the same is offered for sale, that substance sold or offered for sale is imitation butter.

Sec. 5. No person, by himself for another, shall ship, consign, or forward by any common carrier, whether public or private, any substance designed to be used as a substitute for butter, unless it shall be marked or branded on each tub, box, firkin, jar, or other package containing the same, as provided in this act, and unless it be consigned by the carrier and receipted for by its true name: Provided, That this act shall not apply to any goods in transit between foreign States across the State of Illinois.

Sec. 6. No person shall have in his possession, or under his control, any substance designed to be used as a substitute for butter, unless the tub, firkin, jar, box, or other package containing the same be clearly and durably marked, as provided in this act: Provided, That this section shall not be deemed to apply to persons who have the same in their possession for the actual consumption for themselves or their families. Every person who shall have in his possession or control any imitation butter for the purpose of selling the same, which is not marked as required by the provisions of this act, shall be presumed to have known during the time of such possession or control the true character and name as fixed by this act of such product.

Sec. 7. Whoever shall have possession or control of any imitation butter or any substance designed to be used as a substitute for butter, contrary to the provisions of this act, for the purpose of selling the same, or offering the same for sale, shall be held to have possession of such property with intent to use it in violation of this act.

Sec. 8. No action shall be maintained on account of any sale or contract made in violation of or with the intent to violate this act by or

through any person who was knowingly a party to such wrongful sale or contract.

Sec. 9. Whoever shall deface, erase, or remove any mark provided by this act, with intent to mislead, deceive, or to violate any of the provisions of this act, shall be guilty of a misdemeanor.

Sec. 10. Whoever shall violate any of the provisions of this act shall be punished by a fine of not less than fifty nor more than two hundred dollars, or by imprisonment in the county jail not to exceed sixty days, for each offense, or by both fine and imprisonment, in the discretion of the court, or the fine alone may be sued for and recovered before any justice of the peace in the county where the offense shall be committed, at the instance of any person, in the name of the people of the State of Illinois as plaintiff.

Sec. 11. It is hereby made the duty of the State's attorney of each county in this State to prosecute all violations of this act upon complaint of any person, and there shall be taxed as his fees in the case the sum of ten dollars, which shall be taxed as costs in the case.

AN ACT to protect the public from imposition in relation to canned or preserved food. (Approved June 27, 1885.)

Section 1. That it shall hereafter be unlawful in this State for any packer or dealer in preserved or canned fruits and vegetables or other articles of food to offer such canned articles for sale after January 1, 1886, with the exception of goods brought from foreign countries, or packed prior to the passage of this act, unless such articles bear a mark to indicate the grade or quality, together with the name and address of such firm, person, or corporation that packed the same or dealer who sells the same. The firm, person, or corporation labeling such goods shall be considered the packer or packers.

Sec. 3. Any person, firm, or corporation, who shall falsely stamp or label such cans or jars containing preserved fruit or food of any kind, or knowingly permit such false stamping or labeling, and any person, firm, or corporation who shall violate any of the provisions of this act shall be

deemed guilty of a misdemeanor, and punished with a fine of not less than fifty dollars; in the case of vendors, and in the case of manufacturers and those falsely or fraudulently stamping or labeling such cans or jars, a fine of not less than five hundred dollars nor more than one thousand dollars, and it shall be the duty of any board of health in this State cognizant of any violation of this act to prosecute any person, firm, or corporation which it has reason to believe has violated any of the provisions of this act, and after deducting the costs of the trial and conviction, to retain for the use of such board the balance of the fine or fines recovered.

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## Pure Food Commissioner's Bill

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For an act to provide for the appointment of a State Food Commissioner and to define his powers and duties and fix his compensation, and to prohibit and prevent adulteration, fraud and deception in the manufacture and sale of articles of food, and to repeal certain acts or parts of acts therein named.

Section 1. Be it enacted by the People of the State of Illinois represented in the General Assembly: That the office of State food commissioner for the State of Illinois is hereby created. Within thirty days after this act shall take effect such commissioner shall be appointed by the Governor, by and with the advice and consent of the Senate, and his term of office shall be for two (2) years from the date of his appointment and until his successor is appointed and qualified. Thereafter the term of office of the commissioner shall be for four years and until his successor is qualified. The salary of the commissioner shall be twenty-five hundred dollars (\$2,500) per annum and his necessary and actual expenses incurred in the discharge of his official duties.

2. Such commissioner may, with the advice and consent of the Governor, appoint two assistant commissioners, each of acknowledged stand-

ing, ability, and integrity, one of whom shall be an expert in the matter of dairy products, and the other of whom shall be a practical and analytical chemist, who shall be known as State analyst. The salaries of such assistants shall not exceed eighteen hundred dollars (\$1,800) each per annum and their necessary and actual expenses incurred in the discharge of their official duties. In case of the absence or inability of the State analyst to perform all the duties of his office, the commissioner may appoint some competent person to assist in the same temporarily.

3. The food commissioner shall have authority to appoint necessary inspectors not exceeding six in number to assist in the work of the food commissioner at such times and for such periods of time as may be required in the enforcement of the dairy food laws of the State. Such inspectors shall have the same right of access to places to be inspected as the commissioner. The compensation of such inspectors shall be three dollars (\$3.00) per day for each day of actual service, and their necessary and actual expenses when so employed.

4. It shall be the duty of the commissioner to enforce all laws that now exist or that may hereafter be enacted in this State regarding the production, manufacture, or sale of dairy products, or the adulteration of any article of food, and personally or by his assistants to inspect any article of food made or offered for sale within this State, which he may, through himself or his assistants, suspect or have reason to believe to be impure, unhealthy, adulterated or counterfeit, and to prosecute, or cause to be prosecuted, and person or persons, firm or firms, corporation or corporations, engaged in the manufacture or sale of any adulterated or counterfeit article or articles of food contrary to the laws of this State.

5. It shall be the duty of the food commissioner to carefully inquire into the quality of the dairy and food products, and the several articles which are foods or the necessary constituents of food, which are manufactured for sale or sold or exposed or offered for sale in this State, and he may in a lawful manner procure samples of the same, and direct the State analyst to make due and careful examination of the same, and report to the commissioner the result of the analysis of all or any such food or dairy products as are adulterated, impure or unwholesome, in contravention of

the laws of this State, and it shall be the duty of the commissioner to make complaint against the manufacturer or vender thereof in the proper county, and furnish the prosecuting attorney with the evidence thereon and thereof to obtain a conviction for the offense charged. The food commissioner, or his assistants, or any person by him duly appointed for that purpose, shall have power in the performance of their duties to enter any dairy, creamery, cheese factory, store, salesroom, warehouse (excepted bonded warehouses for the storage of distilled spirits), where goods are stored or exposed for sale, or place where they have reason to believe food is stored or offered for sale, and to open any cask, tub, jar, bottle or package containing or supposed to contain any article of food, and examine or cause to be examined the contents thereof, and take therefrom samples for analysis. The person making such inspection shall take such samples of such articles of produce, in the presence of at least one witness, and he shall, in the presence of such witness, mark or seal such sample and shall tender, at the time of taking, to the manufacturer or vender of such produce, or to the person having the custody of the same, the value thereof, but if the person from whom such sample is taken shall request him to do so, he shall, at the same time and in the presence of the person from whom such property is taken, securely seal up two samples of the article seized or taken, the one of which shall be for examination or analysis under the direction of the commissioner, and the other of which shall be delivered to the person from whom the article was taken. Any person who shall obstruct the commissioner or any of his assistants by refusing to allow him entrance to any place which he desires to enter in the discharge of his official duty, or refuse to deliver to him a sample of any article of food made, sold or exposed for sale by such person, when the same is requested, and when the value thereof is tendered, shall be guilty of a misdemeanor, punishable by a fine of not exceeding fifty dollars (\$50.00) for the first offense, and not exceeding five hundred dollars (\$500) or less than fifty dollars (\$50.00) for each subsequent offense.

6. It shall be the duty of the state's attorney in any county of the State, when called upon by the commissioner or any of his assistants, to render any legal assistance in his power to execute the laws and to prosecute cases arising under the provisions of this act.

7. The State board of health may submit to the commissioner, or to any of his assistants, samples of food or drink for examination or analysis, and shall receive special reports, showing the results of such examination or analysis.

8. It shall be unlawful for the State analyst, while he holds his office, to furnish to any individual, firm or corporation any certificate as to the purity or excellence of any article manufactured or sold by them to be used as food or in the preparation of food.

9. The salary of the commissioner shall be paid from the fund appropriated for the payment of the salaries of State officers, and his assistants shall be paid out of the State treasury from the same fund and in the same manner as the salaries of other employes of the State are paid, and their official expenses shall be paid at the end of each calendar month upon bills duly itemized and approved by the Governor, and the amount necessary to pay such salaries and expenses is hereby appropriated.

10. The commissioner may, under the direction of the Governor, fit up a laboratory, with sufficient apparatus for making analysis contemplated in this act, and for such purpose the sum of fifteen hundred dollars (\$1,500), or so much thereof as may be necessary, is hereby appropriated; and for the purpose of providing materials, and for necessary expenses connected with the making of such analysis, there is also hereby appropriated so much as may be necessary, not exceeding six hundred dollars (\$600) annually. The appropriation provided for in this section shall be drawn from the State treasury upon certified bills approved by the Governor.

11. The commissioner shall make an annual report to the Governor on or before the first day of January in each year, which shall be printed and published. Such report shall cover the doings of his office for the preceding year and shall show, among other things, the number of factories, creameries and other places inspected, and by whom; the number of specimens of food articles analyzed, and the State analyst's report upon each one when the analysis indicates the same to be contrary to law; the number of complaints entered against persons for violation of the laws relative to the adulteration of food; the number of convictions had

and the amount of fines imposed therefor, together with such recommendations relative to the statutes in force as his experience may justify. The commissioner may also prepare, print and distribute to the newspapers of the State, and to such persons as may be interested or may apply therefor, a monthly bulletin containing results of inspections, the results of analysis made by the State analyst of articles offered for sale contrary to law, with popular explanation of the same, and such other information as may come to him in his official capacity relating to the adulteration of food and drink products and of dairy products, so far as he may deem the same of benefit and advantage to the public; also a brief summary of all the work done during the month by the commissioner and his assistants in the enforcement of the laws of the State, but not more than ten thousand copies of each of such monthly bulletins shall be printed: Provided the necessary printing shall be done by the State printer, and all expense for stationery and printing shall be audited and paid from the same fund and in the same manner as other State printing and stationery.

All fines, penalties and costs recovered for violations of this act and other acts now enacted or hereafter to be enacted prohibiting or regulating the adulteration of foods shall be paid into the State treasury to the credit of the general fund of the State.

12. No person shall, within this State, manufacture for sale, have in his possession with intent to sell, offer for sale, or sell any article of food which is adulterated within the meaning of this act.

13. The term "food," as used herein, shall include all articles whether simple, mixed or compound, used for food, candy, drink or condiment by man or domestic animals.

14. An article shall be deemed to be adulterated within the meaning of this act:

First—If any substance or substances has or have been mixed with it so as to depreciate, lower or injuriously affect its quality, strength or purity.

Second—If any inferior or cheaper substance or substances has or have been substituted wholly or in part for the article.



Third—If any valuable necessary constituent or ingredient has been wholly or in part abstracted from it.

Fourth—If it be an imitation of and sold under the name of another article.

Fifth—If it is mixed, colored, coated, polished or powdered, whereby damage or inferiority is concealed, or if by any means it is made to appear better or of greater value than it really is.

Sixth—If it contains wholly or in part of a decomposed, putrid, infected, tainted or rotten animal or vegetable substance or article, whether manufactured or not, or, if it is the produce of a diseased animal, or if of an animal that has died otherwise than by slaughter. Provided, that an article of food that does not contain any ingredient injurious to health, and in the case of mixtures or compounds, which may be now, or from time to time hereafter, known as articles of food under their own distinctive names, or which shall be labeled so as to plainly indicate that they are mixtures, combinations, compounds or blends, and not included in definition fourth of this section, shall not be deemed to have been adulterated. Provided, further, that all manufactured articles of food offered for sale shall be distinctly labelled, marked or branded with the name of the manufacturer and place of manufacture, or the name and address of the packer or dealer who sells the same.

15. No person shall manufacture for sale, offer or expose for sale, sell or deliver, or have in his possession with intent to sell or deliver, any vinegar not in compliance with the provisions of this act. No vinegar shall be sold as apple, orchard or cidar vinegar which is not the product of pure apple juice, known as apple cider and apple orchard or cider vinegar upon test shall contain not less than one and three-fourths per cent, by weight, of cider vinegar solids upon full evaporation at the temperature of boiling water.

16. All vinegar made by fermentation and oxidation without the intervention of distillation shall be branded with the name of the fruit or substance from which the same is made. All vinegar made wholly or in part from distilled liquor shall be branded "distilled vinegar." All fer-

mented vinegar, not distilled, shall contain not less than one and one-fourth per cent, by weight, upon full evaporation (at the temperature of boiling water), of solids contained in the fruit from which said vinegar is fermented, and said vinegar shall contain not less than two and a half tenths of one per cent ash or mineral matter, the same being the product of the material from which said vinegar is manufactured. All vinegar shall be made wholly from the fruit or grain from which it purports to be or is represented to be made, shall contain no foreign substance, and shall contain not less than four percent, by weight, of absolute acetic acid

17. No person shall manufacture for sale, offer for sale or have in his possession with intent to sell, any vinegar found upon test to contain any preparation of lead, copper, sulphuric acid or other mineral acid, or other ingredients injurious to health. All packages containing vinegar shall be marked, stenciled or branded on the head of the cask, barrel or keg containing such vinegar, with the name and residence of the manufacturer or dealer, together with the brand required in section 16 of this act.

18. No person shall offer for sale, sell or deliver for food or drink purposes, ice, natural or manufactured, containing any decomposed, putrid, infected, tainted or rotten animal or vegetable substance or any ingredient which is poisonous or injurious to health. If intended for food or drinking purposes, shall not be composed of water of lower standard of purity than that required for domestic purposes by the state board of health.

19. Any person or persons manufacturing for sale or selling or offering to sell any candies or confectioneries adulterated by the admixture of terra alba, barytes, talc or other earthy or material substances, or any poisonous colors, flavors or extracts or other deleterious ingredients detrimental to health, shall, upon proper conviction thereof, be punished by a fine of not less than ten nor more than one hundred dollars or imprisonment in the county jail not less than ten nor more than thirty days, or both such fine and imprisonment, in the discretion of the court.

20. No packer or dealer in preserved or canned fruits and vegetables or other articles of food, shall sell or offer for sale such canned or preserved fruits and vegetables or other articles of food, unless

such articles bear a mark, stamp, brand or label bearing the name and address of the firm, person or corporation that packs same, or dealer that sells same. All soaked or bleached goods or goods put up from products dried before canning, shall be plainly marked, branded, stamped or labeled as such, with the words "soaked" or "bleached goods" in letters not less than two-line pica in size, showing the name of the article and name and address of the packer or dealer who sells same.

21. No person shall manufacture for sale, have in his possession with intent to sell, offer or expose for sale, or sell as fruit, jelly, jam, or fruit butter, any jelly, jam or imitation fruit butter or other similar compound made or composed, in whole or in part, of glucose, dextrine, starch or other substance, and colored in imitation of fruit jelly, jam or fruit butter; nor shall any such jelly, jam or fruit butter or compound be manufactured or sold, or offered for sale, under any name or designation whatever, unless the same shall be composed entirely of ingredients not injurious to health; and every can, pail or package of such jelly, jam or butter sold in this State shall be distinctly and durably labeled "imitation fruit, jelly, jam, or butter," with the name and address of manufacturer or dealer who sells same.

22. Extracts made of more than one principle must be labeled with the name of each principle or else simply with the name of the inferior or adulterant.

In all cases when an extract is labeled with two or more names, the type used is to be similar in size and the name of any one of the articles used is not to be given greater prominence than another. The word compound cannot be used. Extracts which cannot be made with the fruit, berry or bean, and must necessarily be made artificially, as raspberry, strawberry, etc., shall be labeled "artificial." Chocolates and cocoas must not contain substances other than cocoa mass, sugar and flavoring and will not be required to be labeled "compound" or "mixture." Prepared cocoanut, if so labeled, shall contain nothing but cocoanut, sugar and glycerine, and shall not be classed as compound or mixture.

23. Whoever shall falsebrand, mark, stencil or label any article or product required by this act to be branded, marked, stenciled or labeled

or shall remove, alter, deface, mutilate, obliterate, imitate or counterfeit any brand, mark, stencil or label so required, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than twenty-five nor more than two hundred dollars, and costs of prosecution, or by imprisonment in the county jail for not less than thirty days nor more than ninety days, or by both such fine and imprisonment in the discretion of the court, for each and every offense.

24. The taking of orders, or the making of agreements or contracts by any person, firm or corporation, or by any agent or representative thereof, for the future delivery of any of the articles, products, goods, wares or merchandise embraced within the provisions of this act, shall be deemed a sale within the meaning of this act.

25. Every person manufacturing, offering or exposing for sale or delivery to a purchaser any article intended for food, shall furnish to any person, or analyst or other officer or agent appointed hereunder who shall apply to him for the purpose and shall tender him the value of the same, a sample sufficient for the analysis of any such article which is in his possession. Whoever hinders, obstructs or in any way interferes with any inspector, analyst or other officer appointed hereunder, in the performance of his duty, and whoever wilfully neglects or refuses to do any of the provisions of this act, shall be guilty of a misdemeanor, and upon conviction shall, where no specific penalty is prescribed by this act, be punished by a fine not exceeding two hundred nor less than twenty-five dollars, or by imprisonment in the county jail for a period not exceeding ninety days, or by both such fine and imprisonment, in the discretion of the court.

26. All acts and parts of acts inconsistent with this act, and section 6 of an act entitled "An Act to prevent the adulteration of butter and cheese, or the sale and disposal of the same, or the manufacture or sale of any article as a substitute for butter or cheese, or any article to be used as butter and cheese," approved June 1, 1881, be and they are hereby repealed.

27. For the purpose of enabling dealers in products affected by this act to dispose of same without loss, it is hereby expressly provided that the penalties of this act, and prosecution under the same, are suspended until the first day of July, 1900.

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## MEMBERSHIP LIST FOR 1903

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### A

Atchison, M. C., Woodbine.  
Alexander, C. B., Chicago (Star  
Union Line.)  
Allen, Fred J., (C. M. & St. P. R. R.)

Adams, Chas. J., Loda.  
Anderson, C. A., Altuna.  
Ardrey, R. G., Oakdale.

### B

Biddulpr, J. R., Providence.  
Barwell, J. W., Waukegan.  
Boethke, Wm., Elmhurst.  
Bloyer, Otto, Elkhorn Grove.  
Bloyer, George, Harper.  
Burton, D. C., Kaneville.  
Blood, F. J., Chicago (Wells, Rich-  
ardson & Co.)  
Browning, H. A., Elgin.  
Buelter, Henry, Batavia.  
Barclay, A. C., Elgin.  
Bueler, Anton, Bemes.  
Bell, K. J., 306 Fisher bldg., Chi-  
cago.

Betts H. S., Rockford.  
Boehmer, H., Barrington.  
Bagley, F. R., Chicago (Francis D.  
Moulton & Co.)  
Breed, G., Galesburg.  
Bloomfield, R. A., Mt. Sterling.  
Burton, G. F., Mt. Carroll.  
Baldwin, Geo. H., Mendon.  
Beatty, Frank, Fairhaven.  
Blakeway, Miss Ada M., Ridott.  
Benton, D. C., Kaneville.  
Bartholomew, C. L., Cedarville.  
Brinker, F. H., Winneshiek.  
Boyd, John, Morrison.

### C

Clapp, C. E., Quincy.  
Carpenter, K. B., Thomson.

Carbaugh, Wm. T., Lanark, R. R. 1.  
Christ, John, Washington.

Charles, A. D., St. Charles.  
 Cheesman, James, 2112 Michigan  
 ave., Chicago.  
 Carr, George S., Aurora.  
 Coolidge, J. H., Galesburg.  
 Camp, L. E., Blanchardville, Wis.  
 Crissey, N. O., Avon.  
 Campbell, A. B., Oregon.  
 Coolidge, John, Galesburg.  
 Cooley, Fred A., Yorktown.  
 Crosier, Eli I., Utica.  
 Caven, George, Chicago.

Cook, F. L., Lyle.  
 Cooper, Miss Mae, Steward.  
 Carr, J. W., Aurora.  
 Carr, F. A., Aurora.  
 Cooley, J. H., Hillsdale.  
 Collyer, W. D., Chicago.  
 Catherman, Mrs. R. E., Rock City.  
 Cutler, Geo. A., Herbert.  
 Currier, J. B., Freeport.  
 Campbell, M. S., Genoa.  
 Coolidge, C. P., Winnebago.

## D

Dubois, F. S., Rockford.  
 Davis, S. E., Elgin.  
 Davis Bros., Fairchild.  
 Danielson, Peter, McConnell.  
 Davis, C. W., Woodstock.  
 Davenport, Prof. E., Urbana.  
 Davis, A. E., Jr., Urbana.

Dickinson, A. J., Ft. Wayne, Ind.  
 Davis, Wm. F., Quincy.  
 Duel, H R., Franks.  
 Dunlap, Mrs. Theodore, Abingdon.  
 Dorsey, L. S., Moro.  
 De Lano, H. W., Sugar Grove.  
 Dyer, Chas. M., Little Rock.

## E

Eastman, H., Shabona.

Everts, M. C., 60 Wabash ave., Chi-  
 cago.

## F

Finch, N. W., Victor.  
 Frein, H. P., Smithton.  
 Freund, S. H., Johnsburgh.  
 Francisco, M., Wauconda.  
 Fulrath, P. G., Gristol.  
 Fraser, Prof. W. J., Urbana.

Fairchild, A. E., Chicago.  
 Erf, Prof. Oscar, Manhattan, Kan.  
 Fredericks, Andrew, Chicago (De  
 Laval Separator Co.)  
 Foubain, B. C., Belvidere.  
 Fryer, Wm., Winslow.

## G

Gurler, H. B., DeKalb.  
 Gurler, G. H., DeKalb.  
 Gullickson, Martin, Frankfort Sta-  
 tion.  
 Grover, W. J., Belvidere.

Gray, Samuel, Hastings.  
 Grout, A. P., Winchester.  
 Gibbons, T. H., Elgin.  
 Glover, A. J., Elgin.  
 Gray, Miss Nellie, Hastings.

## H

Herman, G., Manhattan.  
Houghland, A. C., 14 N. Clark st.,  
Chicago.  
Hopkins, H. H., Hinckley.  
Hollister, W. S., Pana.  
Hopkins, Geo. C., Oregon  
Haecker, Prof. T. L., St. Anthony  
Park, Minn.  
Hicks, J. E., Thomson.  
Henry, R. J., Millersburg.  
Hoppensteadt, Geo. W., Eagle Lake.  
Hostetter, W. R., Mt. Carroll.  
Hardiker, F. H., Chicago (Mer-  
chants' Despatch Transportation  
Co.)

Hostetter, A. B., Springfield.  
Holisington, S. S., Stillman Valley.  
Harvey, W. R., Clare.  
Hynes, W. J., Evansville, Wis.  
Herkenheim, P. J., Malta.  
Howe, T. J., Owatonna, Minn.  
Horsing, S. S., Stillman Valley.  
Howell, Carrie B., R. R. No. 2, Ur-  
bana.  
Hatch, Fred. L., Spring Grove.  
Hall, C., R. R. No. 1., Cantrill.  
Hunt, James R., Ottawa.  
Hovey, E. L., Capron  
Hilfiker, Jas H., Manhattan.

## J

Jennings, A. A., Chicago (Star  
Union Lines.)  
Johnson, Lovejoy, Stillman Valley.  
Johnson, L. E., Byron.  
Janes, W. E., Hinsdale.

Jensen, S. M., Orangeville.  
Johnson, Frank, Rockford.  
Jacobs, F. I., 185 South Water st.,  
Chicago.

## K

Kerns, Walter, Warren.  
Kniggs, L. H., McHenry.  
Kendall, George, Mt. Carroll.  
Kirkpatrick, J. R., Oakdale.  
Kilbourne, C. S., Aurora.  
Kruse, Wm., Ontarioville.

Kruempel, Gustave, Frankfort Sta-  
tion.  
Kimzey, W. R., Tamaroa.  
Keeney, Z. J., Chicago (Sharples  
Co.)

## L

Ludwig, Mat, Lockport.  
Lally, W. A., Chicago (Erie Des-  
patch Transportation Co.)  
Long, M., Woodstock.  
Lucas, O. F., Belvidere.  
Lloyd, W. B., Glen Ellyn.  
Lorah, G. W., Sugar Grove.

Loud, E. P., (Francis D. Moulton &  
Co.) Chicago.  
Litchhardt, Herman, Schaumburg.  
Lorengen, C., Rockford.  
Latzner, J. A., Greenville.  
Leass, S. L., Sullivan.

## M

Mann, W. E., Pecatonica.  
Metzger, F. L., Millstadt.  
McNish, F. J., Chicago (Creamery  
Package Mfg. Co.)  
Moore, W. S., Chicago.  
Muller, F. J., Milledgeville.  
McCredie, Wm., Elgin.  
Mallory, Grant, Freeport.  
Mason, J. L., Elgin.  
Mason, J. P., Elgin.  
McFarland, Frank, Big Rock.  
Myers, O., Little Rock.

Murphy, R. R., Garden Prairie.  
Monrad, J. H., New York  
Musselman, S. L., Brookville.  
Maurer, W. H., Rock Grove.  
McFarland, Frank, Big Rock.  
McConnell, Carrie, Ridott.  
Michener, E. P., Chicago (Brigg's  
House.)  
Mann, F. J., Gilman.  
Machamer, J. G., Lanark.  
McNurlin, Wm., L., Stewart.  
Montgomery, A. R., Capron.

## N

Nowlan, Irvin, Toulon.  
Nelson, Peter, Creston.  
Nolan, H., Hinckley.  
Newman, Joseph, Elgin.

Newman, John, Elgin.  
Nolting, E. L., Elgin.  
Nolting, August, Elgin.  
Newman, Balch W., Elgin.

## O

Olson, Chas., Kirkland.  
Ohi, Wm., Stevens.

Osgood, Chicago (Cry. Pkg. Mfg.  
Co.)

## P

Poplett, C. A., Dunlap.  
Powell, J. W., Peoria (Merchants'  
Despatch Transportation Co.)  
Petit, Peter, North Aurora.  
Patterson, J. P., Plainfield.  
Peak, S. W., Winchester.  
Powell, L. A., Bowen.  
Phillips, Louis, Germantown.  
Patton, R. A., Hanna City.  
Peterson, Berger, Round Grove.

Palmer, F. R., Pearl City.  
Pitteplace, G. L., Hinckley.  
Phillips, J. A., Damascus.  
Patterson, R. M., Chicago.  
Purvis, Miller, 224 Dearborn st.,  
Pfingston, H. W. F., Schaumburg.  
Pierce, Harry, Savanna.  
Palmer, H. W., McLean.  
Purviance, H. P., Lincoln.  
Porter, G. L., Ft. Atkinson, Wis.

## R

Redpath, R. G., Baldwin.  
Rutter, Geo. F., Sr., Libory.

Rice, H. B., Lewiston.  
Roessler, Theodore, Shelbyville.



Reed, Geo., Belvidere.  
Rawson, Frank E., Alden.

Robertson, N. Y., 262 Wabash ave.,  
Chicago.

## S

Shearer, A. J., Aurora.  
Sykes, Josiah, Kaneville.  
Sudendorf, E., Elgin (Wells, Richardson & Co.)  
Spicer, C. W., Edelstein.  
Spicer, J. G., Edelstein.  
Sears, Howard O., Garden Prairie.  
Spanger, E., Big Rock.  
Sloggett, John, Hinckley.  
Stewart, John, Elburn.  
Sturgis & Burn Co., Chicago.  
Sullivan, Miss Lizzie, Providence.  
Sally, A. J., Garden Prairie.  
Spies, L. A., St. Jacob.  
Staples, W. S., Hooppole.  
Steidley, A. B., Carlinville.  
Spencer, C. V., Chicago.  
Swanzy, L. M., Ridott.

Sawyer, J. F., 79 Dearborn st., Chicago.  
Shamel, Clarence A., Chicago.  
Schlattman, Fred, St. Libory.  
Springer, Mrs. Eva H., Springfield.  
Slouborg, Thomas, Savanna.  
Straw, T. H., Shannon.  
Springsteen, P. J., Egan.  
Schoch, Irwin E., Damascus.  
Seidel, C. H., Orangeville.  
Speed, Chas. V., Baileyville.  
Seidel, C. H., Orangeville.  
Savage, B. W., Sigel.  
Stevens, J. D., 306 Fisher bldg.,  
Chicago.  
Scotey, W. H., Greenup.  
Spaulding, F. W., 22 Sacramento  
st., Chicago.

## T

Thompson, A. E., Poplar Grove.  
Thompson, Frank B., Greenwood.  
Thurston, Henry F., 355 Dearborn  
st., Chicago.

Thompson, M. H., Elgin.  
Taylor, W. H., Stillman Valley.  
Thornton, Chas H., Argyle.  
Tindall, W. K., Malta.

## V

Van Patten, David, Plainfield.

## W

Wright, F. W., Joslin.  
Wood, R. L., Woodhull.  
Wilson, Geo. R., Monmouth.  
Welford, R. G., Red Bud.  
Wilson, E. L., Manhattan.  
Wilder, C. R., Manhattan.  
Waspi, J. S., Spring Grove.

Wright, S. N., Elgin.  
Woolverton, D. C., Chicago.  
Walline, C. W., Cambridge.  
Wolf, F. R., Dakota.  
Wolf, Mrs. E., Rock City.  
Wood, D. E., Elgin.  
Willson, W. C., Elgin.

Woodard, C. H., Big Rock.

Woodring, F. W., Dubuque, Ia.

Winton, W. W., Madison, Wis. (C.  
St. P. & M. R. R.)

Waterman, Geo. E., Garden Prairie.

Wentworth, E. M., Davenport, Ia.  
(Star Union Lines.)

Wilson, D. W., Elgin.

Winnebago Butter Mfg. Co., Win-  
nebago.

Wilkening, W. C., Schaumberg.

Walton, Edw. B., Arma.

Wescott, N. E., Dennison, Ia.

Welch, W. K., Wyandotte, Mich.

Woodburg, A. E., Danville.

Y

Young, H. J., Stillman Valley.

Young, W. H., Aurora.

Young, F. L., Kaneville.

# Table of Contents

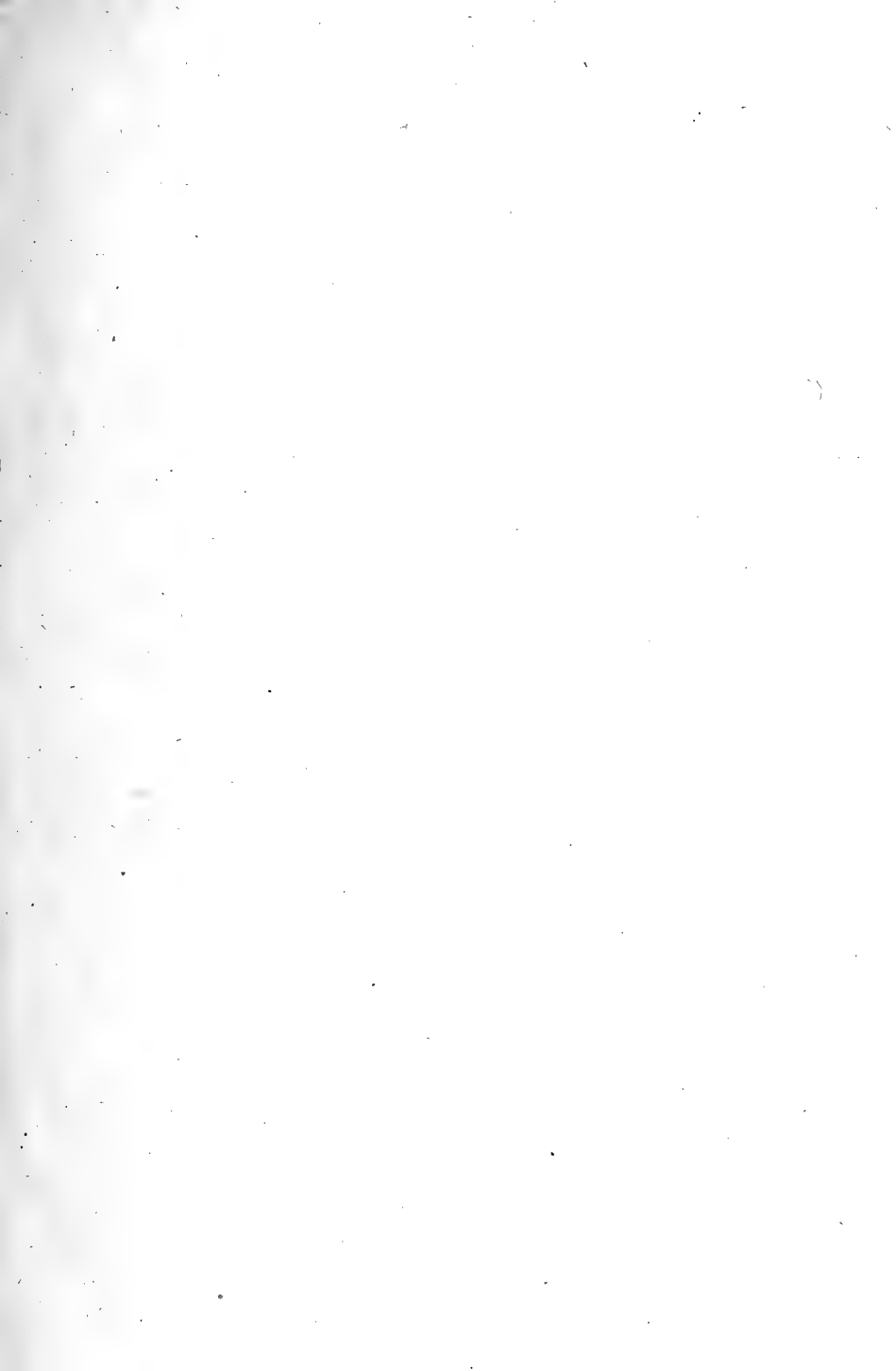
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	Page
Letter of Transmittal .....	3
List of Officers .....	4
By Laws of the Illinois Dairymen's Association .....	5
Proceedings of the Twenty-Ninth Annual Meeting .....	9
Prayer—Rev. Franklin McGraff .....	9
Address of Welcome .....	10
Address .....	12
Response—Mr. C. H. Gurler .....	13
President's Address .....	14
The Different Taints of Milk—J. A. Latzer .....	21
Making the Best Grade of Milk—H. B. Gurler .....	31
Farm Buttermaking and County Organizations—Mrs. H. Purviance...	39
Reception in Cow Stable, University Barns .....	46
Why Not—H. B. Gurler .....	46
Caged—Dr. V. P. Burrill .....	47
Room at the Top—Dean Davenport .....	49
Aim and Work of the Department of Dairy Husbandry—Dean Davenport .....	51
The Elements of Agricultural Science in Rural Schools—Prof. F. H. Hall .....	58
Remarks by Dean Davenport .....	70
Why There Are Not More Cheese Factories in the State of Illinois—J. R. Biddulph .....	72

Representing the Holstein Breed or Cattle—M. S. Campbell .....	77
Representing the Jersey Breed of Cattle—H. C. Taylor .....	82
Representing the Brown Swiss Breed of Cattle—E. M. Barton, by Mr. James .....	88
Representing Short Horn Breed of Cattle—Fred L. Hatch .....	92
Representing the Ayrshire Breed of Cattle—John Stewart .....	96
Address—Chas. Y. Knight .....	103
Selection and Care of the Dairy Herd—H. C. Taylor .....	110
Prof. Haecker .....	117
Bacteriological Contamination of Milk—Prof. H. L. Russell .....	119
Record of Individual Cows on Dairy Farms—Arthur J. Glover .....	133
Dairy Conditions and Suggestions for Their Improvement—W. J. Fraser .....	184
Protein Requirements—T. L. Haecker .....	199
First Step in the Handling of Milk—Dr. C. E. Marshall .....	211
Methods of Corn Breeding—Cyril George Hopkins, Ph. D. ....	221
Directors' Meetings, 1902-1903 .....	238
The Bloomington Meeting .....	238
Secretary's Report .....	239
Treasurer's Report .....	241
The 1904 Convention .....	244
Report of the Fifth Annual Butter Fair of the Sangamon County But- termakers' Association .....	245
College of Agriculture .....	248
Dairy Laws of Illinois .....	258
Pure Food Commissioners' Bill.....	268
Membership List for 1903 .....	277

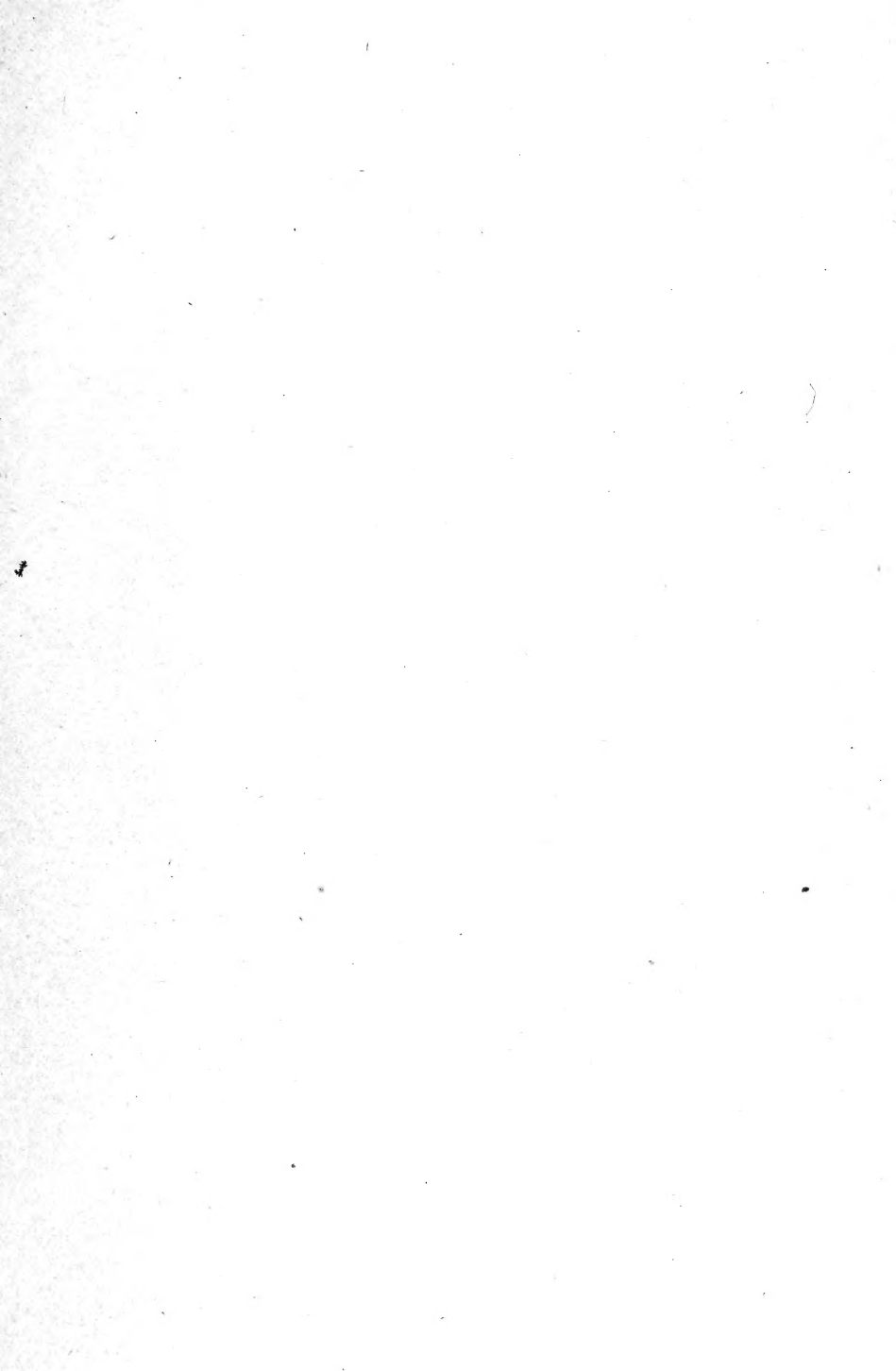




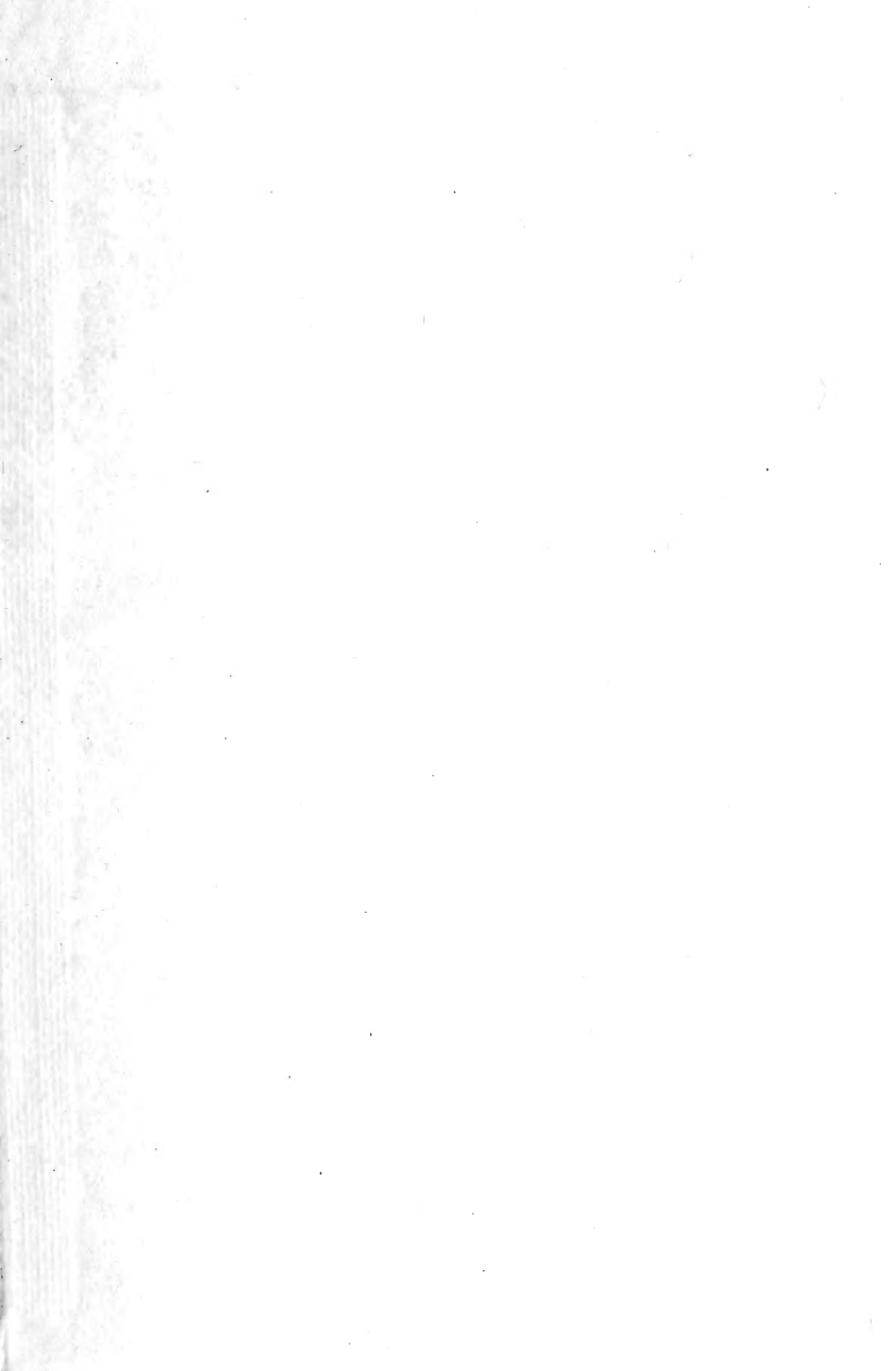












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